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THE WORLD BOOK
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COMPREHENSIVE

In Twelve Volumes

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THE WORLD BOOK

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P R E F A C E

WHEN the first edition of THE WORLD BOOK appeared, in 1917, it was offered to the public as a new kind of encyclopedia. In selecting the most interesting, vital, and useful information out of the world's knowledge, and in presenting it in an orderly, simple, and attractive manner, the makers of THE WORLD BOOK believed that they had established a new standard in the field of reference works. That confidence has been amply justified. During the years of its existence, THE WORLD BOOK has met the severest of all tests—usefulness and dependability in the school, the home, the office, and the library. Its readers, young and old, have been generous and enthusiastic in their praise of its readability, its scope, and its judicious selection of material.

THE WORLD BOOK has been critically examined not only by lay readers but also by librarians and by special committees of educational organizations charged with the task of evaluating reference books, as well as other kinds of literature, for children and adults in the home, for pupils in elementary and secondary schools, and for students in college. Without any exception, lay readers, specialists, and committees of experts have commended THE WORLD BOOK on account of its success in organizing and presenting all worth-while knowledge in such an orderly, intelligible, and attractive form.

Since THE WORLD BOOK was first published, epoch-making changes have occurred in human life. Radio has come into the home; the air mail has become a commonplace; men have crossed the ocean in flying machines; and there have been added to our current speech such terms, denoting new developments, as *television*, *televox*, *vitaphone*, and *stenotype*. In physics, in chemistry, in medicine, in education, in religion, in psychology—in every field of human interest and endeavor—revolutionary progress has been made. Even our maps have had to be reconstructed, for old and powerful empires have fallen, while the newer nations have begun to make history. It was for these reasons that the publishers of THE WORLD BOOK decided to produce an entirely new work—that should embody the best features of the original encyclopedia and that should also mirror our changed and changing world.

The result of this decision is THE WORLD BOOK Encyclopedia of to-day, a new and larger work that is up-to-date, accurate, and comprehensive. The charm of style, simplicity of treatment, and human interest that made the original work a favorite have all been retained, but there is vastly more material in the new volumes. Every subject included in elementary and high-school courses is treated, and from the modern viewpoint. Hundreds of articles have been added, including biographies of present-day writers, musicians, scientists, and others; and numerous scientific and geographical articles have been wholly rewritten or expanded, to bring them into line with the latest discoveries and changes. So rapid has been the development in the field of invention that, where four pages sufficed for a discussion of aircraft in 1917, the department in the new work has been expanded to cover thirty-eight pages. Chemistry, electricity, the Einstein Theory, moving pictures, and radio, among many other subjects, have undergone appropriate enlargement.

In the making of this work, the editors have had the coöperation of a great body of distinguished specialists who have served as critics, reviewers, and authors, and whose initials place the stamp of accuracy, dependability, and adequacy on all important articles. Exacting standards in respect to style, balance, and mode of presentation have been maintained throughout the work. In order to avoid error and to make every article authorita-

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tive, many different persons have read both manuscript and proof of all important articles.

Certain valuable features of organization, typical of *THE WORLD BOOK*, have been retained in the new encyclopedia, namely:

(1) The outlines and lists of questions that accompany many major articles, enabling the reader to systematize the subject matter of the text, and designed to be especially valuable for the teacher.

(2) The lists of Related Subjects at the close of general articles, each serving as an index of supplementary and collateral information.

(3) The graphic method of presenting statistics and other facts, so that the relative importance of products, areas, etc., may be readily grasped.

Fully ten thousand illustrations beautify the pages and amplify the text of *THE WORLD BOOK Encyclopedia*. These halftones, diagrams, graphics, and symbolic pictures make each of the volumes a treasury of art; but no illustration has been included that does not contribute to the understanding of the subject matter.

Colored maps showing physical features and political divisions accompany the articles on the states of the Union and on the important countries. Especially prepared for the new work, these maps embody the latest advances in the art of map-engraving, and they present all recent changes in respect to boundaries and spelling of geographic names. (See *How to Read a Map*, page xvi.)

To facilitate the reader's search for information, the editors of the new encyclopedia have devised a comprehensive system of cross-reference titles, all of which appear in the body of the work, in the regular alphabetical order. In thus listing all topics as an integral part of the volumes themselves, the editors have made it unnecessary for the reader to search for any title in a separate index. This system is one generally recommended by librarians.

A *Reader's Guide*, provided in connection with the volumes, presents, it is believed, the most complete and satisfactory classification of knowledge ever attained in a work of this kind. This logical grouping of all topics gives organization to the subject matter as a whole, reveals the underlying relationships, and furnishes a course of study for every branch of learning.

The size and the style of type adopted for *THE WORLD BOOK Encyclopedia* were selected from the standpoint of maximum legibility and minimum eye fatigue. In these selections, the editors and publishers gave careful consideration to the advice of recognized authorities, and to the results of experiments conducted in psychological laboratories. That the type and illustrations might receive the most effective setting possible, a special paper of high quality has been used.

The Editor-in-Chief wishes to express his appreciation of the cheerful and whole-hearted coöperation given by everyone who has participated in the making of this encyclopedia. Had it not been for the efficient and responsible labors of our authors, reviewers, and editorial staff, this great undertaking could not have been brought to a successful completion. Especial credit belongs to the Managing Editor, Mr. Ellsworth D. Foster, who carried the chief burden of making the original *WORLD BOOK*, and who entered upon the new work with an enthusiasm and a devotion that were sustained throughout. Upon him devolved the major task of guiding the enterprise and of welding a multitude of details into a harmonious and balanced whole. Great credit is also due Mr. Gordon Saint Clair, Art Director, for the new standard established in encyclopedia illustration.

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HOW TO READ A MAP

THE WORLD BOOK contains 288 pages of maps and map statistics. These include three maps of each continent, one of each important country, and one of each state in the American Union. For the first time in the history of encyclopedia making, those of the states show both political and physical features, highly developed in detail. Special attention is called to the state maps, because of the real story to be read in any one of this new series.

How to Locate a City on a State Map. Turn to the map of New Jersey, which appears with the article on that state, and take Atlantic City as an example. In the index on the back of the map, Atlantic City is listed, and its population is given, together with a letter and a figure—D-5. At the right of the map, find the figure 5; at the bottom, the letter D. Trace left from 5, and upward from D; near the point where these imaginary lines meet, Atlantic City will be found. The discovery will be made that it is on a narrow island. It is not the county seat; that distinction belongs to Mays Landing, on the Egg River, about seventeen miles inland, to the northwest. (Notice in the Key how county seats are indicated.)

Railroads. The railroads which enter Atlantic City are numbered 3 and 142. Reference to the index of railroads in one corner of the page indicates that these are the Atlantic City and the Pennsylvania lines. The index number assigned to a railroad in any state is the same in every state in which that road is found. Thus, 142 represents the Pennsylvania in all states into which that line extends.

Physical Maps Present Surprising Information. Continue inspection of the map of New Jersey. Consult the key to the colors representing the contour of the state. It will be apparent at a glance that were the land surface to be lowered 100 feet, nearly half of the state would be under water; every large city except Paterson would disappear; two islands of considerable size and one smaller one would remain in the central and southern sections. In only three places is the elevation as much as 1,000 feet above the sea—among the hills in the north.

County Boundaries. Most maps which show the territorial limits of counties are marked so indistinctly that the lines are in many instances not legible. State maps in **THE WORLD BOOK** present a vast improvement in this important respect.

New Jersey Referred to as a Type. One who has followed the suggestions above with respect to one state will be able to read with understanding the map of any other state.

KEY TO PRONUNCIATION

The pronunciation of titles is indicated by accenting the word or by respelling it phonetically in italics. In the phonetic spelling, letters are used to indicate the sounds which they most commonly represent.

A vowel is *short* when followed by a consonant in the same syllable, unless the syllable ends in silent *e*. It is also short when alone in an unaccented syllable.

A vowel is *long* when accented and standing alone or in a syllable which ends in silent *e*, or when ending an accented syllable.

S is always soft, and never has the sound of *z*.

The hard sound of *c* is represented by *k*.

The foreign sounds which have no equivalent in the English language are represented as follows:

K for the German *ch*, as in Bach: (**BACH**, *ba K*).

N for the French *n*, as in Breton: (**BRETON**, *bre to N'*).

ö for the German *ö*, as in Göttingen: (**GÖTTINGEN**, *gö' ting en*).

ü for the German *ü*, as in Blücher: (**BLÜCHER**, *blük' er*).

THE WORLD BOOK

MODERN
ENCYCLOPEDIA
PICTORIAL
COMPREHENSIVE

A a

A. Almost all the alphabets of the world, no matter how unlike they may be in other respects, have *a* as their first letter. But while in most of the languages of the present day *a* represents but one sound, in English it represents eight sounds, as in the



words *father, fat, fate, fare, final, fall, what, and ask*. It is used, moreover, to form digraphs, as in *heat* and *boat*.

It seems probable that the Phoenicians, who invented the alphabet, represented by their capital *A* an ox's head; but when the Greeks adopted the alphabet they turned this first letter upside down, making it look much like the capital *A* to-day, and thus the letter lost all of its picture quality. See ALPHABET.

A r, a term which, when used in its popular sense, is a slang phrase, but not objectionable. It is intended to denote a high quality of excellence or a condition perfectly satisfactory. The origin of **A r** is due to its use by Lloyd's agency in London to indicate the quality of risk in the insurance of vessels, and when placed opposite the name of a boat indicates absolute seaworthiness.

The leading American financial reporting agencies adopted the symbols, with variations, to indicate a business man's credit rating and capital. These are discussed at length under the heading **COMMERCIAL AGENCY**.

AACHEN, *ah' ken*, since 1815 the name of Aix-la-Chapelle. See **GERMANY** (Principal Cities).

AALBORG. See **DENMARK** (The Cities).

AARD-VARK, *ahrd-vahrk*, meaning *earth-pig* in Dutch, is an ant-eater found in South Africa. It has a piglike snout, a long and flexible tongue covered with sticky saliva, large pointed ears, and short, reddish hair. The limbs are very muscular. On the front feet are four, and on the hind feet five, powerful claws with which it burrows into the ground or tears to pieces the hills of termites and ants on which it feeds. It sleeps by day and feeds by night. The total length of the animal is about five feet, including the hairless tail.

The flesh is eaten by natives, though it tastes

of formic acid derived from the bodies of the ants eaten. The animal is also hunted for its skin, and is becoming scarce. The natives easily catch it by closing its burrow while it is



Photo: Wide World

AARD-VARK

absent. When alarmed, it rushes to its home and endeavors to dig itself out of sight. See **EDENTATA**; **TERMITES**; **ANT-EATER**. L.H.

Scientific Name. The aard-vark belongs to the family *Orycteropodidae*. The species described above is *Orycteropus capensis*. A closely related species, *O. aethiopicus*, inhabits the northeastern part of Central Africa.

AARD-WOLF, *ahrd-wulf*, a somewhat uncommon, flesh-eating animal, found in un-

forested sections of Africa. Its name means *earth-wolf*. Zoölogists usually classify the aard-wolves in a separate family, intermediate between the hyena and the mongoose (both of which see). The aard-wolf has the sloping back of the hyena; it also has the latter's habit of prowling at night in search of dead animals. Its coat is reddish, striped with black, the head pointed. There are five toes on the forefeet and four on the hind feet. An outstanding characteristic of the aard-wolf is its possession



AARD-WOLF

of small, weak teeth, which prevents its preying on any but the smallest vertebrate animals. Aside from carrion, bugs and ants form its chief food. Its flesh is not edible. M.J.H.

Scientific Name. The aard-wolf is the only representative of the family *Proteidae*. It is classed as *Proteles cristata*.

AARHUS, ahr' hoos. See DENMARK (The Cities).

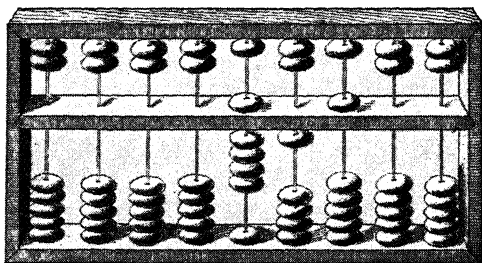
AARON, air' un, the first high priest of Israel, the eldest brother of Moses. Because he was a more fluent speaker than his brother, he became spokesman for Moses when the latter was working to bring about the deliverance of the Jews from the Egyptians, and he himself called down several of the most grievous plagues upon Pharaoh. While Moses was receiving his wonderful vision on Mount Sinai, Aaron listened to the pleadings of the Israelites and made for them an idol in the form of a golden calf. Because of the same sin which kept Moses out of the promised land, Aaron, too, was excluded from Canaan, and was buried on Mount Hor. See MOSES.

ABACA, ah bah' kah, See PHILIPPINE ISLANDS (What the Islands Are Like).

ABACUS, ab' a kus, a simple device for indicating numbers in addition and subtraction. It was in common use among the ancient Greeks and Romans, and is still to be seen in the shops in remote towns of Persia and other countries of the Orient. The Chinese abacus is called *shwanpan*, meaning *reckoning board*.

The abacus now is little more than a curiosity, but it was long used in primary schools for

teaching the elements of number. It consists of a rectangular frame, in which are fixed parallel rods. On each rod are strung seven beads or balls, two above and five below the



AN ABACUS

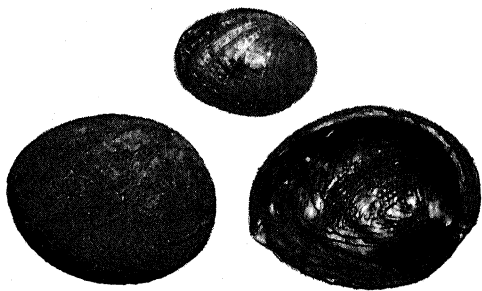
The number indicated by the position of the beads is 91,500. The method of counting is explained below.

horizontal bar. When in use, the abacus should be held horizontally, so that the beads will stay in any position desired.

Method of Counting. Each bead below the bar counts one, and each bead above counts five; but to be included in a number the bead must be pushed close to the bar. In the illustration, no beads are pushed up to bar in the right-hand or units column, or in the next column to the left, the tens column. From right to left, in order, the remaining figures are 5 in the hundreds column, 1 in the thousands, and 9 in the ten-thousands, making the number 91,500. The size of the number which can be indicated by an abacus is limited only by the number of columns of beads; the highest number possible on the abacus shown in the illustration is 999,999,999. J.W.Y.

[For abacus in architecture, see COLUMN (Doric Column).]

ABALONE, ab a lo' ne, from its shape also called *ear shell*, is a mollusk whose shell resembles a shallow dish. Its flesh is an article of food used by people near the seacoasts of China and Japan and Western United States.



ABALONES

In the two larger shells, the one at the left is shown with unpolished exterior; the inner surface is polished. The small shell has a polished exterior.

The shell is valuable for its lining of mother-of-pearl (which see). The abalone lives on rocks at the bottom of the sea, near the shore, and is caught in scoops or taken by divers. In Amer-

ica it is found on the California coast, where it is collected for export to the Orient and for food. See MOLLUSKS. S.H.S.

Scientific Name. The abalone belongs to the family *Haliotidae*. The type genus is *Haliotis*.

ABANDONMENT, a voluntary relinquishment of possession, and of all rights to a specific thing. In law, one who makes the decision to abandon may be held accountable in certain cases for his act. It is a crime to abandon a dependent person, as a child or a helpless adult member of the family; if death results from such desertion, the charge of murder may be pressed. Infant abandonment, whatever results from the act, is in most states a misdemeanor (which see). Desertion for a definite time of wife and family, and desertion of husband by the wife, provide grounds for divorce.

The term also applies to the relinquishment of property rights, but here many considerations are involved; some authorities claim that there can be no loss of right to property by abandonment. Local statutes on the subject vary widely.

ABATEMENT, a term in law which means nullifying, making void, or putting an end to a matter. It suspends, but need not terminate, the proceedings in a suit.

Abatement of a Nuisance. This is the remedy open to a person who is injured in his rights by the near presence of something objectionable. A tannery in a strictly residential neighborhood, a house of ill repute, domestic animals roaming at will and dangerous to public safety are among the things which may be abated through appeal to authority.

Abatement of Freehold. A comparatively rare instance of possession of land by an unauthorized person between the date of the owner's death and the time when it could be claimed by the heirs is adjusted under freehold statutes which dispossess the unlawful occupant.

Abatement of Suit. A proceeding is suspended when too many parties are joined in a suit or wrong causes of action are joined.

ABBAS HIMLI, *ah' baks him' le*. See EGYPT (Under British Rule).

ABBESS. See ABBOT.

AB'BEY, in its original sense, a monastery or convent governed by an abbot or abbess (see ABBOT). Very commonly, however, the term is applied to a church which now is or was once connected with a monastery, as Westminster Abbey (which see). In England, it may mean a private residence which was formerly a part of a religious community but was given over by Henry VIII to secular purposes. Thus, Lord Byron's home was known as Newstead Abbey. See MONASTICISM.

ABBEY, EDWIN AUSTIN (1852-1911), one of the leading American painters, most widely known for his series of mural paintings, *The*

Quest of the Holy Grail (see HOLY GRAIL), in the book-delivery room of the Boston Public Library. He was born in Philadelphia, and had become known as an illustrator before his removal to London in 1883. There his illustrative work, especially that done for editions of Shakespeare, won him such fame that in 1901 he was commissioned to paint the coronation of Edward VII.

The last years of his life were devoted to mural decorations in the Pennsylvania state house. These pictures, which portray incidents in the history of the state, are recognized as his greatest work.

ABBOT, a name derived from a Greek word meaning *father*, and therefore identical with the familiar "Abba, Father" of the New Testament (see *Mark* XVI, 36). In the early days of the monastic orders the title was given to any monk, but later its scope became more limited and applied only to the head of a monastery or abbey. During the Middle Ages, when the monasteries gained great wealth and importance, the abbots held positions of real power, many of them owing allegiance only to the Pope, and not to the bishops. Some of them gained political power, and at one time in England there were twenty-six in the House of Lords. Usually the abbot is chosen by the monks of the monastery which he is to serve, and is confirmed by a bishop or by the Pope. He holds office for life.

Abbess. The corresponding head in a community of nuns is called an *abbess*.

ABBOTSFORD, the famous estate of Sir Walter Scott (which see). In connection with the story of Scott, an illustration of Abbotsford appears.

ABBOTT, GRACE, second director of the Children's Bureau (which see).

ABBOTT, JACOB (1803-1879), born in Maine, educated in Bowdoin College and ordained a minister in the Congregational Church, became famous as a writer of wholesome books for young people, particularly boys. He touched also the field of history for juveniles, and in all produced over 200 volumes. He possessed a fascinating style.

Some of His Books. The *Rollo Books* (28 connected volumes) were based on adventure and travel; *Franconia Stories* (10 volumes) in part were given an historic basis; *The Rainbow and Lucky Series* (5 volumes) comprised historical material for the young. This list includes his most popular productions.

ABBOTT, JOHN STEVENS CABOT (1805-1877), an American historian, brother of Jacob Abbott, also a popular writer (see above). He was a native of Maine and a graduate of Bowdoin College (1825). He became a Congregational pastor in 1830, soon thereafter was a writer on pedagogical subjects, and

within ten years gave his time entirely to the writing of history.

His Books. Volumes on pedagogy included *The Mother at Home* and *The Child at Home*. In the field of history he published *History of the Civil War in America*, *History of Napoleon Bonaparte*, *Napoleon at Saint Helena*, *History of Frederick II*, *Called Frederick the Great*, and *History of Napoleon III*.

ABBOTT, LYMAN (1835-1922), a distinguished American clergyman and editor, the successor of Henry Ward Beecher (which see).

He was born in Roxbury, Mass., a suburb of Boston, and was graduated from New York University in 1853. He practiced law for a time before he felt drawn toward the traditional vocation of his family, the ministry. Ordained in 1860, he was pastor for five years in Terre Haute, Ind., and then for four years was at the New England Church, New York.

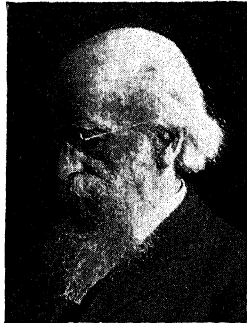


Photo: U & U
LYMAN ABBOTT

For twenty years thereafter he was engaged in literary work, becoming associated with Beecher, editor of the *Christian Union* (now *The Outlook*). Following Beecher's death (1887), Abbott filled his place on this magazine and as pastor of Plymouth Church, Brooklyn, resigning from the latter position in 1899 to devote more time to writing.

Some of His Books. Among his works are many volumes on religious and social topics. *Reminiscences* appeared in 1915; *Silhouettes of My Contemporaries*, in 1921.

ABBREVIATIONS, shortened forms of words, used to save time and space. In ancient and medieval times, when manuscripts were copied by hand, such labor-saving devices became very common. They took two forms: omission of letters from a word or group of words, and the use of arbitrary symbols to take the place of words. After the invention of printing, numerous abbreviations of the former type were retained and are still used; of the arbitrary symbols, few remain, the most common being the sign & for *and*.

Frequently only the initial letter is used to represent a word, but since this would often give rise to ambiguity, other letters are added. One device in common use is the doubling of a letter to designate a plural or a superlative; thus *f.* means *loudly* and *ff.*, *very loudly*; *p.* means *page* and *pp.*, *pages*. Arbitrary symbols are not in reality abbreviations, but are used for the same purpose. The following is a list of contractions in very common use:

- A. Acre.
- A. B. *Artium Baccalaureus*, Bachelor of Arts.
- acc., a/c, or acct. Account.
- A. D. *Anno Domini*, in the year of our Lord.
- A. D. C. Aide-de-camp.
- adj. Adjective.
- Adj. Adjutant.
- ad lib. *Ad libitum*, at pleasure.
- Adm. Admiral.
- adv. Adverb.
- A. E. F. American Expeditionary Forces.
- aet. *Aetatis*, aged.
- A. F. & A. M. Ancient Free and Accepted Masons.
- A. F. L. American Federation of Labor.
- Ala. Alabama.
- Alas. Alaska.
- Alta. Alberta.
- A. M. *Ante meridiem*, before noon; *Ars Magister*, Master of Arts.
- amt. Amount.
- anon. Anonymous.
- Apr. April.
- Archd. Archdeacon.
- arith. Arithmetic.
- Ariz. Arizona.
- Ark. Arkansas.
- Aug. August.
- Aus. Austria.
- Ave. Avenue.
- avoir. Avoirduois.
- B. A. Same as A. B. Bachelor of Arts.
- Bapt. Baptist.
- Bart. Baronet.
- bbl. Barrel.
- B. C. Before Christ; British Columbia.
- B. D. *Baccalaureus Divinitatis*, Bachelor of Divinity.
- Belg. Belgium.
- Brig. Brigade; brigadier.
- Brig. Gen. Brigadier General.
- B. S. or B. Sc. Bachelor of Science.
- B. T. U. British Thermal Unit.
- bu. Bushel.
- B. V. *Bene vale*, farewell.
- C. *Centum*, one hundred; Centigrade: *circa*, about.
- Calif. California.
- Can. Canada.
- Capt. Captain.
- Card. Cardinal.
- C. B. Companion of the Bath.
- cc. Cubic centimeter.
- C. E. Civil Engineer.
- C. E. F. Canadian Expeditionary Forces.
- cf. *Confer*, compare.
- C. J. Chief Justice.
- cm. Centimeter.
- C. M. G. Companion of (the Order of) Saint Michael and Saint George.
- c/o. Care of.
- Co. Company; county.
- C. O. D. Cash (or collect) on delivery.
- Col. Colonel.
- Colo. Colorado.
- Con. *Contra*, against, in opposition.
- Cong. Congress.
- conj. Conjunction.
- Conn. or Ct. Connecticut.
- Cr. Creditor.
- cts. Cents.

ABBREVIATIONS

ABBREVIATIONS

C. V. O. Commander of the Victorian Order.
 cwt. Hundredweight.
 d. Pence.
 D. Five hundred; *denarius*, penny.
 D. C. *Da Capo*, from the beginning—in music it means repeat, District of Columbia.
 D. C. L. Doctor of Civil Law
 D. D. *Divinilis Doctor*, Doctor of Divinity.
 D. D. S. Doctor of Dental Surgery.
 Dec. December; declination.
 deg. Degree.
 Del. Delaware.
 Dept. or Dpt. Department.
 D. Litt. Doctor of Literature. Same as Litt. D.
 D. O. Doctor of Osteopathy.
 do. *Ditto*, the same.
 doz. Dozen.
 Dr. Debtor; doctor.
 D. Sc. Doctor of Science.
 D. S. O. Distinguished Service Order.
 D. V. *Deo volente*, God willing.
 E. E. Electrical Engineer.
 E. & O. E. Errors and omissions excepted.
 e. g. *Exempli gratia*, for example.
 E. M. Mining Engineer.
 E. M. F. Electromotive force.
 Eng. England.
 Esq. Esquire.
 et. al. *Et alii*, and others
 etc. or &c. *Et cetera*, and others, and so forth.
 et seq. *Et sequentes, et sequentia*, and what follows.
 f. *Forte*, loudly; franc.
 Fhr. or F. Fahrenheit.
 far. Farthing.
 Feb. February.
 ff. *Fortissimo*, very loudly; following.
 Fig. Figure.
 fl. Florin.
 Fla. Florida.
 f. o. b. Free on board.
 Fr. France; French; franc.
 F. R. S. Fellow of the Royal Society.
 ft. Foot; feet.
 g. Gram.
 Ga. Georgia.
 gal. Gallon.
 G. A. R. Grand Army of the Republic.
 G. C. B. Knight Grand Cross of the Bath.
 G. C. D. Greatest Common Divisor.
 G. C. L. H. Grand Cross of the Legion of Honor.
 G. C. M. G. Knight Grand Cross of Saint Michael and Saint George.
 G. C. V. O. Knight Grand Commander of the Victorian Order.
 Gen. General.
 Ger. Germany, German.
 Gov. Governor.
 Gov.-Gen. Governor-General.
 gr. Grain (weight).
 Gr. Greek.
 hhd. Hogshead.
 H. M. S. His (or Her) Majesty's Ship, or Service.
 Hon. Honorable.
 H. R. H. His Royal Highness.
 h. p. Horse power.
 hr. Hour.
 Ia. Iowa.
 ib. or ibid. *Ibidem*, in the same place.
 id. *Idem*, the same.

Ida. Idaho.
 i. e. *Id est*, that is
 Ill. Illinois.
 in. Inch; inches.
 incog. *Incognito*, unknown.
 Ind. Indiana; index.
 inst. *Instante mense*, this month.
 interj. Interjection.
 I. O. U. I owe you.
 I. S. O. Imperial Service Order.
 It. Italy.
 Jan. January.
 J. P. Justice of the Peace.
 Jr. Junior.
 Kan. Kansas.
 K. B. King's Bench; Knight of the Bath.
 K. C. King's Counsel.
 K. C. B. Knight Commander of the Bath.
 K. C. M. G. Knight Commander of Saint Michael and Saint George.
 K. G. Knight of the Garter.
 K. G. C. B. Knight of the Grand Cross of the Bath.
 kg. or kilo. Kilogram.
 km. Kilometer.
 Knt. or Kt. Knight.
 Ky. Kentucky.
 L. Fifty.
 La. Louisiana.
 lb. or lbs. *Libra* or *librae*, pound or pounds in weight.
 L. C. Lower Canada; Lord Chamberlain.
 L. C. J. Lord Chief Justice.
 L. C. M. Least Common Multiple.
 L. I. Long Island.
 Lieut. Lieutenant.
 L. H. D. or Litt. D. *Litterarum Humaniorum Doctor*. Doctor of Literature.
 LL. D. *Legum Doctor*, Doctor of Laws.
 LL. M. *Legum Magister*, Master of Laws.
 loc. cit. *Loco citato*, in the place cited.
 M. *Monsieur*; *meridiem*, noon; one thousand; meter; mark.
 M. A. Master of Arts; Military Academy.
 Maj. Major.
 Man. Manitoba.
 Mar. March.
 Mass. Massachusetts.
 M. B. or Mus. B. *Musicae Baccalaureus*, Bachelor of Music.
 M. C. Member of Congress; Master of Ceremonies; Master Commandant.
 M. C. E. Master of Civil Engineering.
 M. D. Doctor of Medicine.
 Md. Maryland
 mdse. Merchandise.
 Me. Maine.
 M. E. Methodist Episcopal; Military or Mechanical Engineer.
 Messrs. or MM. *Messieurs*, gentlemen.
 Mex. Mexico, or Mexican.
 mi. Mile.
 Mich. Michigan.
 min. Minute.
 Minn. Minnesota.
 Miss. Mississippi.
 Mlle. *Mademoiselle*.
 mm. Millimeter.
 Mme. *Madame*, Madam.
 Mo. Missouri.
 mo. Month.

- Mont. or Mon. Montana.
 M. P. Member of Parliament; Member of Police;
 Methodist Protestant.
 M. P. P. Member of Provincial Parliament.
 M. R. Master of the Rolls
 Mr. Mister.
 Mrs. Mistress.
 M S. Master of Science; *Memoriae sacrum*, sacred
 to the memory.
 MS. Manuscript.
 MSS. *Manuscripta*, manuscripts.
 Mus. D. Musical Doctor; Doctor of Music.
 M. V. O. Member of the Victorian Order
 N. North; noun.
 N. B. New Brunswick; *nota bene*, mark well,
 take notice.
 N. C. North Carolina.
 N. D. North Dakota.
 N. E. New England; northeast.
 Neb. Nebraska.
 Nev. Nevada.
 N. F. Newfoundland.
 N. H. New Hampshire.
 N. J. New Jersey.
 N. M. New Mexico.
 no. *Numero*, number.
 non. seq. *Non sequitur*, it does not follow
 Nov. November.
 N. P. Notary Public.
 N. S. Nova Scotia.
 N. S. W. New South Wales.
 N. Y. New York.
 N. Z. New Zealand.
 O. Ohio.
 Oct. October; *octavo*, eight pages.
 O. K. (Slang.) All right or correct.
 Okla. Oklahoma.
 O. M. Order of Merit.
 Ont. Ontario.
 Ore. Oregon.
 oz. *Onza*, ounce.
 p. Page; part, *piano*, softly.
 Pa. or Penn. Pennsylvania.
 P. C. Privy Council.
 P. E. I. Prince Edward Island.
 Penn. or Pa. Pennsylvania.
 Per cent. *Per centum*, by the hundred.
 Ph. B. *Philosophiae Baccalaureus*, Bachelor of
 Philosophy.
 Ph. D. *Philosophiae Doctor*, Doctor of Philos-
 ophy.
 pk. Peck.
 P. M. *Post meridiem*, afternoon, evening; Past
 Midshipman; postmaster.
 P. O. Postoffice.
 Pop. Population.
 pp. Pages; *pianissimo*, very softly.
 P. P. C. *Pour prendre congé*, to take leave.
 prep. Preposition.
 Pres. President.
 Presb. Presbyterian.
 Prof. Professor.
 pron. Pronoun.
 pro. tem. *Pro tempore*, for the time being.
 prox. *Proximo mense*, next month.
 pt. Pint; part.
 P. S. *Postscriptum*, postscript.
 pwt. Pennyweight.
 Q. E. D. *Quod erat demonstrandum*, which was
 to be proved.
 qt. Quart.
 Que. Quebec.
 q. v. *Quod vide*, which see.
 r. Rod.
 R. A. Royal Academician.
 R. A. M. Royal Arch Mason
 recd. Received.
 Rev. Reverend.
 R. I. Rhode Island
 R. N. Royal Navy.
 R. R. Railroad
 R. S. V. P. *Répondez, s'il vous plaît*, answer, if
 you please.
 Rt. Rev. Right Reverend.
 Ry. Railway.
 S. South; shilling.
 Sask. Saskatchewan.
 S. C. South Carolina; Supreme Court.
 Sc. B. *Scientiae Baccalaureus*, Bachelor of Science.
 scr. Scruple.
 S. D. South Dakota.
 sec. Second.
 Sept. September.
 Serg. Sergeant.
 S. O. S. Radio distress signal.
 sq. Square.
 Sr. Senior.
 SS. Steamship.
 S. S. Sunday School.
 St. Street; saint.
 S. T. D. Doctor of Sacred Theology.
 Supt. Superintendent.
 Tenn. Tennessee.
 Ter. Territory.
 Tex. Texas.
 Treas. Treasurer.
 Twp. Township
 U. C. Upper Canada.
 ult. *Ultimo mense*, last month.
 U. S. A. United States of America; United States
 Army.
 U. S. M. United States mail.
 U. S. N. United States Navy.
 U. S. S. United States Senate; United States
 ship.
 Ut. Utah.
 Va. Virginia.
 V. C. Victoria Cross.
 viz. *Videlicet*, to wit, namely.
 vs. *Versus*, against.
 Vt. Vermont.
 W. West.
 W. A. Western Australia.
 Wash. or Wn. Washington.
 W. C. T. U. Woman's Christian Temperance
 Union.
 W. Va. West Virginia.
 Wis. Wisconsin.
 wt. Weight.
 Wy. Wyoming.
 Xmas. Christmas.
 yd. Yard.
 Y. M. C. A. Young Men's Christian Association.
 Y. W. C. A. Young Women's Christian Associa-
 tion.
 yr. Year.

A-B-C POWERS, an abbreviation identi-
 fying Argentina, Brazil, and Chile as leading
 South American countries in the field of
 Spanish-American diplomacy. (See articles on
 the countries named.)

ABDICATION, the resignation of a sovereign. The word may mean either *renunciation*, a voluntary withdrawal, or *deposition*, a forced resignation. Abdication has been in most cases involuntary—forced by political circumstances. It is interesting to note that kings of England cannot abdicate without the consent of Parliament; the form of monarchy not only limits their power, but their right of resignation as well.

The more important abdications follow:

Richard II of England.....	1399
Charles V, Holy Roman Empire.....	1556
Charles Emmanuel IV of Sardinia.....	1802
Charles IV of Spain.....	1808
Joseph Bonaparte of Naples.....	1808
Gustavus IV of Sweden.....	1809
Louis Bonaparte of Holland.....	1810
Napoleon of France.....	{ 1814
	{ 1815
Victor Emmanuel of Sardinia.....	1821
Charles X of France.....	1830
William I of Holland.....	1840
Louis Philippe of France.....	1848
Ferdinand of Austria.....	1848
Charles Albert of Sardinia.....	1849
Isabella II of Spain.....	1870
Amadeus I of Spain.....	1873
Abd-ul-Aziz of Turkey.....	1876
Alexander of Bulgaria.....	1886
Milan I of Serbia.....	1889
Abd-ul-Hamid of Turkey.....	1909
Hsuan-Tung of China.....	1912
Nicholas II of Russia.....	1917
Constantine I of Greece*.....	1917
Ferdinand I of Bulgaria.....	1918
Charles I of Austria.....	1918
William II of Germany.....	1918
All German kings and princes.....	1918

*Restored in 1920; second abdication, 1922.

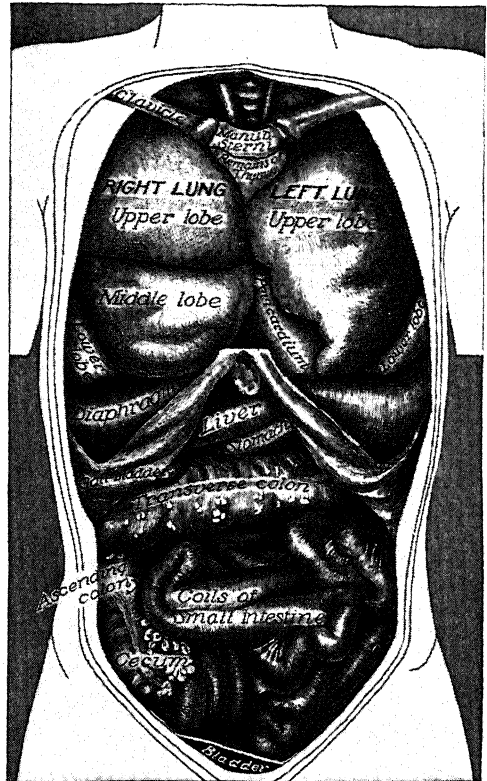
Abdication may also be applied to sovereigns of the old Papal States. In the history of the Roman Catholic Church, the following Popes have abdicated:

Marcellinus.....	308
Liberius.....	366
Benedict IX.....	1044
Gregory VI.....	1046
Saint Celestine V.....	1294
Gregory XII.....	1415

ABDOMEN, *ab doh' men*. In man, the abdomen is that part of the body situated between the thorax, or chest, above, and the pelvis, below. It is a cavity which contains the intestines, stomach, liver, and other organs. These organs are known collectively as *abdominal viscera*. The abdomen is lined by a thin membrane called the *peritoneum* (from the Greek word meaning to *fold about*, or *over*). This membrane is folded over the organs in such a way as to hold them in their proper positions. Since it is a moist membrane, it also serves the important purpose of preventing these organs from adhering to one another.

The peritoneum may become inflamed. This condition, known as *peritonitis*, is both painful and very serious. Such conditions as appendicitis may cause this inflammation, if not cared for immediately.

The abdomen is separated from the thorax by the diaphragm. It communicates directly with the pelvis below (see **PELVIS**). The wall of the abdominal cavity in front is made up of



In the above illustration, not only is the abdominal cavity shown, with its contents, but also the organs above it, that the clear connection between the two sections may be evident.

the long muscles that extend from the ribs to the bony pelvis. The vertebral column and muscles of the back form the posterior wall. Tight clothing which constricts the abdominal cavity is very undesirable, and has been largely abandoned by modern women. K.A.E.

Related Subjects. The anatomy and physiology of this part of the body will be made clear by a careful reading of the articles on the following topics:

Bile	Kidneys
Chyle	Liver
Chyme	Pancreas
Diaphragm	Pelvis
Digestion	Peritoneum
Gall Bladder	Spleen
Intestine	Stomach

ABDOMINAL BRAIN. See **SOLAR PLEXUS**.

ABDOMINAL VISCERA, *vis' er ah*. See **ABDOMEN**.

ABDUCTION, in law, the forcible removal of a woman in order to secure her fortune or her person, or to compel her to comply with certain demands. It is regarded as distinct from like removal of a child of either sex, which is called *kidnapping* (which see). Abduction is a criminal offense, and is severely punished upon conviction. The penalty is most severe in England and Canada, where the laws prescribe a minimum penalty of five years' imprisonment, with life sentence as a maximum. In the United States, the punishment varies according to the laws of the state in which the offense occurs, usually consisting of a fine and imprisonment from one to five years.

ABDUCTOR MUSCLE. See **OYSTER**.

ABDUL AZIZ. See **WAHHABIS**.

ABDUL-HAMID II, *ahb' dul hah meed'* (1842-1918), thirty-fourth sultan of the Turkish Empire, the man whose harsh treatment of Christians called forth from Gladstone the famous epithet, "Unspeakable Turk." He succeeded to the throne on the deposition of his elder brother, Sultan Murad V, in 1876. Turkey at that time was in a disturbed condition, but Abdul-Hamid took no serious steps toward reform. The Russo-Turkish War (which see) came as a climax to the disturbances in Turkey, and the empire would have been completely overthrown except for the interference of the European powers. Turkey, however, lost Bulgaria, Bosnia and Herzegovina, Montenegro, Rumania, and Serbia, together comprising more than half of its European possessions.

For the next thirty years Sultan Abdul-Hamid was a sorry figure. His empire suffered from all sorts of internal disorders. He frequently promised reforms, usually at the demand of one or another of the European powers, but seldom fulfilled promises. Finally in 1908 he was compelled by the revolutionary party of Young Turks to grant a constitution. In 1909 he was deposed and was succeeded by his younger brother, who ascended the throne with the title of Mehmet V. See **YOUNG TURKS**; **MOHAMMED V**.

ABDULLAH IBN HUSSEIN, *hoos' e in*, king of Transjordan (which see). See, also, **ARABIA**.

ABDUL MEJID EFFEN'DI. See **TURKEY** (History).

Â BECKET, THOMAS. See **BECKET, THOMAS Â**.

ABEL, the second son of Adam and Eve (*Gen. iv, 2*). He was a shepherd and, according to the Biblical story, offered sacrifices "of the firstlings of his flock and of the fat thereof" in such a spirit that they were regarded with greater favor by the Lord than were

Cain's offerings of the fruits of the ground. The latter, enraged at this, slew his brother. See **CAIN**, for the story of the first murder.

ABELARD, PIERRE, *ab' e lard, pe air'* (1079-1142), a French philosopher and theologian, famous in his own time as a bold and original thinker, but remembered in the centuries since his own chiefly for his association with Héloïse. He was born in a village in Brittany, went to Paris as a student at the age of twenty, and there established himself as a philosophical lecturer in 1113. He could conquer in debate the most eloquent masters, and students came to him from Rome, from England, and from Germany.

Chosen by Canon Fulbert as teacher to his niece, the beautiful and accomplished Héloïse, Abelard promptly fell in love with his pupil. When the affair reached the ears of Fulbert, the couple fled, but Abelard returned to Paris. Héloïse denied their marriage, that she might not interfere with his advancement in the Church, and the union was annulled by Fulbert. Abelard thereupon became a monk, and Héloïse a nun. Condemned by the Church as heretical, he withdrew to Nogent-sur-Seine, where he built an oratory called the Paraclete. Until his death he corresponded with Héloïse, who survived him twenty-two years, and her *Letters* to him take rank in literature with the most masterly expressions of love. Their bodies were laid side by side at the Paraclete, but in 1817 were transferred to Paris. See **INNOCENT (II)**.

ABERDEEN. See **SCOTLAND** (The Cities)

ABERDEEN, JOHN CAMPBELL GORDON, Seventh Earl of (1847-), a prominent British political leader, best known as Governor-General of Canada from 1893 to 1898. Aberdeen entered politics as a Conservative, but in 1876 he forsook the party, and was thereafter a leading Liberal and supporter of William E. Gladstone. In 1886, during the short third ministry of Gladstone, he was Lord-Lieutenant of Ireland, and from 1905 to 1915 again held that office. While in Canada he was popular with all classes. One of his minor titles is Baronet of Nova Scotia, originally granted to one of his ancestors in 1642.

ABERDEEN, S. D. See **SOUTH DAKOTA** (back of map).

ABERDEEN, WASH. See **WASHINGTON** (back of map).

ABERRATION, *ab ur a' shum*. The word aberration comes from a Latin word meaning *to wander from a given path*.

Spherical Aberration. This is a term used in physics to denote the failure of rays of light to meet at a common point when they are reflected by a concave mirror or refracted by a convex lens (see **MIRROR**; **LENS**). When parallel rays are reflected from a spherical concave mirror, those that are reflected from

the central portion of the mirror come to a focus at a point farther from the mirror than those that are reflected from points near the outer edge of the mirror (see Fig. 1). Instead of a focal point, the crossings of the various rays form a focal curve called a *caustic*. If light be caused to fall obliquely on the inside wall of a glass almost full of milk, a caustic curve will be seen on the surface of the milk. A similar curve is formed in the case of a spherical convex lens. It is evident that cutting off some of the rays that would strike the mirror or lens near the edge would decrease the aberration. This is done, particularly with cameras, by means of stops—the smaller the stop the sharper the image. When the surface of a mirror or lens is no longer spherical but is of such shape that all rays are brought to a common focal point, it is said to be corrected for spherical aberration. A parabolic mirror has no spherical aberration, nor does a high-grade lens.

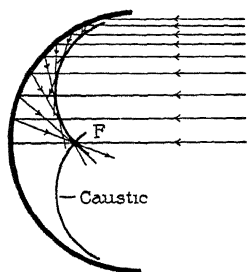


FIG. 1
Spherical concave mirror, showing spherical aberration. Focus is not a single point F, but a series of points forming a caustic curve.

Chromatic Aberration. This is a term used to denote the wandering of different colors of light from a common focal point. Referring to Fig. 2, it will be seen that the convex lens

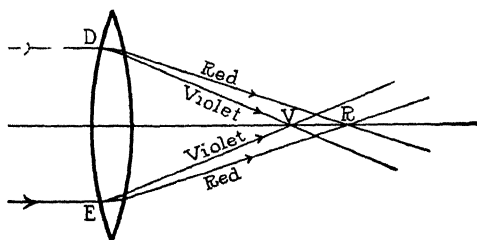


FIG. 2

Chromatic aberration produced by a single lens. Focus for violet rays at V, red rays at R, with other colors lying between V and R.

acts like a prism with its thick edge down, in the case of the ray of light striking it at D, and as a prism with the thick edge up, for a ray of light striking it at E. If these are rays of white light, each will form a spectrum: the violet light, which is deviated most by the prism, forms a violet focal point at V; the red rays, which are bent least, form a focal point at R, with the other colors lying between V and R. All single lenses, regardless of their curvature, exhibit chromatic aberration. It is possible by combining two or more lenses of different kinds of glass to cause the several

colors to focus at practically the same point. Such a lens is said to be corrected for chromatic aberration, and is called an *achromatic* lens. See EINSTEIN'S THEORY OF RELATIVITY.

In Astronomy, aberration is a phenomenon causing heavenly bodies to appear to occupy positions slightly different from their actual locations. If the earth were at rest, and one wanted to observe a star directly overhead, he would point the telescope directly toward it. But since the earth is moving very rapidly, while the light is traveling from the upper end of the telescope to the eyepiece, the eyepiece is moving into a new position. The observer must therefore slant his telescope slightly, so that the eyepiece may be in the proper position to receive the light ray when it arrives. The angle between the true and apparent position of the star is called the angle of aberration (see STAR; PARALLAX).

In Medicine, aberration of the mind is a departure from normal mental health. It is a condition that under some circumstances may result in insanity (which see). A.L.F.

ABESHR, a *besht* 'r, capital of Wadai (which see).

ABIDE WITH ME (hymn). See HYMNS AND HYMN TUNES.

ABILENE, TEX. See TEXAS (back of map).

ABIMELECH, a *bim' e lek*. See ISAAC.

ABIOGENESIS, *ab i' o jen' e sis*. See SPONTANEOUS GENERATION.

ABITIBI RIVER. See MOOSE RIVER.

ABO, *ah' bo*. See FINLAND (The Cities).

ABOLITIONISTS, *ab o lish' un ists*, in American history, a large number of people in Northern United States who became influential during the first half of the nineteenth century in urging the abolition of slavery. The importance of the movement dates from the beginning of the work of William Lloyd Garrison in 1829, and the formation of the American Anti-slavery Society in 1833. Division of opinion soon developed, Garrison and his followers advocating abolition even at the cost of disunion of the republic, while the more moderate party sought abolition through constitutional means. The latter formed the Liberty party and later the Free Soilers, and finally, in 1856, joined the newly organized Republican party. Among the prominent leaders of the radical Abolitionists were Wendell Phillips and John G. Whittier.

Related Subjects. The reader is referred in these volumes to the following articles:

Garrison, Wm. Lloyd	Political Parties	Whittier, John G.
Phillips, Wendell	Slavery	

ABOMASUM, *ab o ma' sum*. See RUMINANTS.

ABORIGINES, *ab o rij' e neez*, the first or earliest known inhabitants of a country. The word is of Latin origin, and literally translated

means *from the beginning*. The ancient Romans applied it to the mythical race said to have been found by Aeneas when he reached the mouth of the Tiber.

The aborigines throughout the world have invariably given way to newer races from other parts of the globe. The migration of peoples has made it uncertain, in some cases, who the original inhabitants were, and the term *aborigines* is frequently applied in a general sense to any native race existing before the white man came. Thus the Mound Builders, the Cliff Dwellers, the Aztecs, and the other Indians of North and South America are aborigines. The study of the conditions under which they lived is a part of archaeology; the study of their relations to other races and to the animal world in general belongs to anthropology. c.w.

Related Subjects. The reader is referred in these volumes to the following articles:

Anthropology	Aztec	Indians
Archaeology	Cliff Dwellers	Mound Builders

ABRAHAM, the greatest of the Hebrew Patriarchs, the real founder of the Israelites. His name was originally Abram, and his birthplace was Ur of the Chaldees, but according to the Biblical story he heeded the call of God and journeyed toward a new land. When he was an old man God made a covenant with him and gave him a new name, Abraham, signifying that he was to be "a father of many nations." Up to this time Sarah, Abraham's wife, had been childless, though Abraham had had one son, Ishmael, born to him by Hagar; but Sarah afterward gave birth to a son, Isaac, who became the legitimate heir of his father. Abraham died at the age of 175, "an old man and full of years," and was buried at Machpelah. His story is told in *Genesis*, chapters xi to xxv. See, also, **ISAAC**; **ISHMAEL**.

ABRUZZI, *ah-broot'* see, **PRINCE LUIGI AMADEO, DUKE OF THE** (1873-), an Italian naval officer, mountain-climber, and Arctic explorer, son of Amadeus, king of Spain, and first cousin to Victor Emmanuel III, king of Italy. He was the first (1897) to ascend Mount Saint Elias, and in 1900 gained fame by his attempt to reach



Photo: U & U

DUKE OF THE ABRUZZI

the North Pole. Though unsuccessful, he attained 86° 39' N. latitude, the most northerly point reached up to that time. In 1906 he ascended the peaks of Mount Ruwenzori, in equatorial Africa, and three years later led a mountain-climbing expedition to the Himalayas, where he established a new record for altitude by reaching near to the top of Mt. Austen, 24,600 feet above sea level. The records of these explorations have been published in several books. He is of peculiar interest to the American people because in 1912 only the objections of the royal family prevented him from marrying a daughter of United States Senator Elkins of West Virginia. In 1915, when Italy joined the Allies in the World War, the Duke of the Abruzzi was placed in command of the Italian fleet, but owing to disagreements, retired in 1917. Afterward he undertook an important colonization scheme in Italian Somaliland.

ABSALOM, the third, and favorite, son of David, king of Israel (see **DAVID**). He was handsome, clever, and possessed of a manner



THE TOMB OF ABSALOM

In the Valley of Jehoshaphat, close by the lower bridge over the Kedron.

that won him universal love, and he made use of his popularity to stir up a rebellion against his father. Defeated in battle and fleeing before the soldiers of his father, he was swept off his mule (*II Sam.* xviii, 9) by an overhanging branch. This held him by his flowing curls until Joab, one of David's captains, approached and killed him. David was overwhelmed with grief. This tragic story, which is told in *II Samuel*, is the subject of a very popular poem, *The Death of Absalom*, by Nathaniel P. Willis. David's love for his son is strikingly shown in the following lines:

But oh! for Absalom—

For his estranged, misguided Absalom—
The proud, bright being who had burst away
In all his princely beauty, to defy
The heart that cherished him—for him he poured,
In agony that would not be controlled,
Strong supplications, and forgave him there
Before his God, for his deep sinfulness.

ABSCESS, *ab'ses*, a collection of pus occurring within the tissue of the body, due to infection with some one of the pus-producing bacteria. Abscesses may occur in any part of the body, although a collection of pus in a body cavity such as the pleural cavity generally goes by another name. An abscess starts with the arrival of the invading bacteria on the area. The blood vessels become dilated, and white blood corpuscles and blood serum make their way from the blood vessels into the tissues. The white blood corpuscles try to destroy the invading bacteria. The exuding blood serum is for the purpose of destroying them or washing them away. The local swelling is due to the dilatation of the blood vessels and the accumulation of white blood corpuscles and serum. The local fever is due to the increase in blood; the pain is due to the pressure on the local nerves. The pus is a mixture of exuded serum, liquefied tissue, and dead white blood cells and tissue cells.

The home treatment of an abscess generally consists in opening it and draining and keeping it as clean as possible. A cold abscess is one in which there is accumulation of pus without local fever or pain, since in many cases cold abscesses are the result of infection with tubercle bacilli.

To prevent abscesses, the entrance of pus-producing bacteria into the tissues must be averted. In the case of skin abscesses, called boils, pimples, and carbuncles, this can be accomplished by keeping the skin very clean and avoiding all irritations. W.A.E.

ABSECON BEACH. See NEW JERSEY (The Land).

ABSINTH, OR **ABSINTHE**, the most harmful of all alcoholic liquors. People who habitually drink absinth to excess always have weak digestions and disordered nerves, and they usually lessen their mental capacity. Absinth is about seventy-five per cent alcohol, as compared with six to eight per cent in the average brew of strongest beer. The peculiar harmfulness of absinth is due to *absinthol*, the essential oil of wormwood (which see), and to other poisonous oils of strong flavors. It is a French drink, but its use, particularly since the World War, is restricted. See WORMWOOD.

ABSINTHOL. See ABSINTH, above.

ABSOLUTE ZERO. See HEAT; TEMPERATURE.

ABSORPTION, *ab sorp' shun*, in physics, is the intermixture of two things in such a way that one of them is taken up by the other and apparently vanishes. We speak of a solid absorbing a liquid or a gas and of a liquid absorbing a gas. Thus, a sponge absorbs water; a lampwick, oil; charcoal, ill-smelling gases; and water, ammonia gas. The absorbed substance is, of course, not annihilated, nor is it without effect upon the properties of the

product. A wet sponge differs in many ways from a dry one, and ammonia water is obviously different from pure water. But the mixed product is more nearly like the absorbing than like the absorbed constituent.

The quantities of the different gases which a given quantity of water will absorb vary greatly. At its freezing temperature (32° F.) 100 gallons of water will absorb only one and one-half gallons of nitrogen, two volumes of hydrogen or four gallons of oxygen. Of carbon dioxide, however, the 100 gallons of water will take up 170 gallons, of hydrochloric acid 50,500 gallons, of ammonia 130,000 gallons, and of hydroiodic-acid gas no less than 157,000 gallons (making a mixture which, though nine-tenths gas by weight, is in the liquid state—a striking instance of the less swallowing the greater).

Fishes and other animals which live under the water are dependent upon the absorbed oxygen for their respiratory supply. The amount of any gas which any liquid will absorb is always greater the lower the temperature and the greater the pressure applied. Soda water is water charged with carbon dioxide under pressure. When the cork of a soda-water bottle is drawn, the pressure in the bottle is released and the excess of gas, bubbling out, produces a foam upon the liquid.

Charcoal (which see) is the solid substance which excels as an absorbent of gases, its use as a deodorizer being due to this property. Calcium chloride and zinc chloride and many other substances absorb water vapor from the air. In many localities, calcium chloride is sprinkled on dusty roads. The chemical absorbs enough moisture from the air to keep the dust damp and therefore so heavy that it will not float in the air. In damp weather even common salt will absorb enough water from the air to cake in a salt-shaker. Dry wool and silk and, to a less extent, dry cotton and linen absorb moisture from the air. Caustic soda and caustic potash absorb both water vapor and carbon dioxide.

Some solid substances when brought into contact with a solution absorb one or more of the dissolved substances from the water. Boneblack takes up coloring matters from sugar solutions (see CARBON), and clay takes up from soil-water some of the substances required by plants—as, for instance, potassium, ammonia, and phosphoric acid. Plants themselves absorb plant food through their roots and root hairs; carbon dioxide is absorbed by the leaves (which see). In all the cases mentioned above, it is matter that is absorbed.

It is common to speak of the absorption of light and of heat, but in these cases it is energy, not matter, that is absorbed. Colored glasses absorb some of the colors of white light, allowing the others to pass. When light falls upon a bright surface such as a mirror it is not all re-

flected. Part of it is absorbed and converted into heat. When the surface is dull and dark, much less of the light is reflected and correspondingly more is absorbed. Silvering a thermos bottle causes it to reflect rather than absorb heat. It is cooler at sunset partly because there is then a deeper layer of the earth's atmosphere through which the sun's rays must pass. These are familiar illustrations of the principles of absorption.

In Physiology. Here the word absorption is applied to the process by which the digested food is taken into the blood and lymph. Medicine and poisons are absorbed in the same way. The term is applied also to the process by which waste matters in the tissues are taken up by the blood. When a swelling or an abscess disappears, the substances from the blood which were temporarily deposited in the sore spot are said to have been absorbed (or resorbed) by the blood. In the lungs of animals, the blood exposed to the air in the fine thin-walled capillaries absorbs oxygen. Chemical union of the oxygen with a substance (hemoglobin) in the blood corpuscles takes place. The product (oxy-hemoglobin) is bright red. This is why the blood in the arteries (which has recently been aerated in the lungs) is so much brighter in color than the blood in the veins (which is on its way back from the tissues to the heart to be sent again to the lungs for aeration). See **BLOOD** (Circulation of the Blood). A.L.F.

Related Subjects. A study of the articles on the following subjects will make clearer the processes of absorption:

IN PHYSICS			
Adhesion	Capillarity	Gas	Light
Air	Cohesion	Heat	Osmosis
IN PHYSIOLOGY			
Blood	Digestion	Lungs	
Capillaries	Lacteals	Lymph	

ABSTRACT, a statement in brief form which comprises the substance of a more complete and comprehensive document or several related documents. The most common form of abstract known to law is that relating to titles to real estate.

Abstract of Title, an abbreviated statement which summarizes the various ownerships through which a parcel of land has passed before reaching its present owner. It names all deeds, mortgages, and liens which from time to time have been recorded in connection with it. An abstract is not dependable unless it presents a complete summary of every item—description sufficiently complete to identify the property, with dates, names of parties, and all conditions and covenants involved. A critical examination of such a detailed history will always disclose any transaction which would break the succession of legal transfers.

The seller of property usually furnishes an

abstract of title to the buyer when he delivers the deed (which see).

ABT, *abht*, FRANZ (1819-1885), a German writer of songs, including both words and music, best known to the general public as composer of the once popular verses, *When the Swallows Homeward Fly*. These songs, while they have little of the lasting quality of truly great music, make a universal appeal.

Abt was born at Eilenburg, studied at Leipzig, and in 1841 became music master at the court theater in Zurich. In 1852 he went to Brunswick as a musical director of the court theater, and there he remained until 1881, when he retired. He composed a number of instrumental selections for the piano, but they were not as well received as his vocal numbers.

ABUTILON, *a bu' ti lon*, a showy plant belonging to the mallow family (*Malvaceae*), with maple-shaped leaves and drooping, bell-shaped flowers of yellow, pink, red, and white. It is also known as the *flowering maple*. The abutilon is a favorite window plant, for it will produce cheerful blossoms all winter long. If seed is sown indoors in early spring and the seedlings are transplanted to the open when the frost period is past, the plants will blossom by autumn. Then, as soon as desired, they can be set in pots and brought indoors for the window garden. New plants can be started from slips cut in the spring or fall. B.M.D.



ABUTILON
Flower and leaf.

Classification. The abutilon described above is *Abutilon venosum*. Another well-known member of the genus is the *Indian mallow* (which see). Compare, also, **HIBISCUS** and **HOLLYHOCK**.

ABYDOS, *a bi' dohs*, an ancient city of Asia Minor, located on the south shore of the Hellespont, now called the Dardanelles, at its narrowest point. The city was famous for its association with the legend of Hero (which see) and Leander. From Abydos, Leander swam nightly to Sestos, on the opposite shore, to see Hero, his beloved. In modern times, Lord Byron, the poet, accomplished this feat once in emulation of the ancient hero. Near Abydos, too, Xerxes and his army in 480 B.C. crossed to Europe. See **HELLESPONT**; **XERXES**.

ABYDOS. See **EGYPT** (Ancient Cities).

ABYLA, *ab' i lah*, one of the Pillars of Hercules. See **HERCULES**, **PILLARS OF**.

ABYSSINIA, *ab i sin' i ah*, until 1923 the official name of Ethiopia (which see).

ACACIA, *a ka' shah*. The plants which are called by this name differ decidedly in certain ways, for some are delicate shrubs and others

mimosa, which they greatly resemble in appearance, certain species of acacia have extremely sensitive leaves. Some of these do not open unless the sun is shining. See GUM ARABIC. G.M.S.

Scientific Names. The acacias proper constitute the genus *Acacia* in the family *Leguminosae*. Certain other trees, belonging to the same family but to different genera, are commonly called acacias. Among these are the common locust tree (*Robinia pseudacacia*), known as acacia or false acacia; and the bristly locust (*R. hispida*), known as rose acacia.

ACADEMY, a school or an association for the promotion of literature, science, or art. The term as now applied to schools, though not now so frequently as in former days, is used mainly in the eastern part of the United States and Canada; there it means a secondary school, primarily to prepare young people for college. Before the development of the high-school system, these institutions, usually under the patronage of a church or religious society, afforded the only means of obtaining a secondary education.

Derivation of Name. Nearly 2,300 years ago, the great Greek philosopher Plato conducted a school in a shady grove a mile from Athens. This grove, according to legend, once belonged to a certain *Academos*, a hero of the Trojan War, and from him Plato's school took its name. See PLATO.

Plato's academy, however, was not a school for boys; it was, rather, an association of young men, eager for knowledge, who sought guidance from a great teacher. The word is therefore also applied to modern associations of men who are engaged in any learned, scientific, or artistic pursuits. The most famous of all such academies is the *French Academy*, established by Cardinal Richelieu in 1635. Its object is to uphold a high standard in French language and literature, partly by the example of its members and partly by the laborious method of preparing the standard French dictionary.

To be elected a member of the Academy is one of the highest honors a Frenchman can receive, and its members are popularly called the "forty immortals." There are many other noted European academies, including the Royal Academy, of British artists; the British Academy, of historians, jurists, economists, philosophers, and philologists; and the Royal Academy of Sciences at Berlin, similar in scope to the British Academy.

American Academies. The first learned academy in America was the American Philosophical Society, founded in Philadelphia in 1743, largely through the influence of Benjamin Franklin. The American Academy of Arts and Sciences was chartered by the state of Massachusetts in 1780, and the Academy of Natural Sciences of Philadelphia was established in 1812. The American Academy of Arts and Letters was founded in 1904, the purpose of its founders being the organization of a body corresponding to the French Academy. The membership is limited to fifty, and the chief qualification for membership is "notable



ACACIA
Branch and fruit.

great trees, and many have bright-hued, fragrant flowers. Not all have the beautiful feathery leaves which make them favorite ornamental plants, but have what appear to be simple instead of compound leaves. In this case it is the leaf stalk, or petiole, as it is called, that becomes leaflike, for in certain species of acacias the real leaf never develops. These leaflike organs are called *phyllodia*.

Most of the acacias grow only in tropical or subtropical countries, but a few are cultivated in mild climates elsewhere. In the United States, the Gulf region and California produce them, and these sections possess few more beautiful plants than an acacia tree covered with its spikes of yellow flowers. Most of the acacias grow in Australia and Africa, however, and some of these species, notably the wattle tree of Australia, contain so much of the extract used for tanning that attempts have been made to introduce them into the United States. Some of the African species produce a good quality of gum arabic, and one of the Indian acacias yields the valuable medicine called *catechu* (which see). Like the

achievement in art, music, or literature." Among its members, past and present, are William Dean Howells, Augustus Saint Gaudens, Samuel L. Clemens, Edward A. MacDowell, Henry James, Theodore Roosevelt, Woodrow Wilson, Daniel C. French, Thomas Nelson Page, Joseph Jefferson, and Joel Chandler Harris. See AMERICAN ACADEMY OF ARTS AND LETTERS.

ACADIA, *a kay' di ah*, the name which the early French settlers gave to the territory now comprising Nova Scotia and New Brunswick, has sentimental and romantic associations that quite overshadow its historic interest. When the French and English began their long and bitter struggle for the possession of the North American continent, Acadia was the home of peace-loving French farmers, who were, in the words of Longfellow—

Men whose lives glided on like rivers that water the woodlands.

During Queen Anne's War (1697-1713), Port Royal, the seat of the Acadian government, surrendered to the English, and when in 1713 the treaty of peace was signed, Acadia was definitely ceded to England. During the years that followed, the Acadians, though nominal subjects of Great Britain, were a source of much anxiety to the British government on account of their sympathy for the French cause, and in 1755, during the French and Indian War, they were commanded to take an unconditional oath of allegiance to the British sovereign. Their refusal to do so was met by an order to leave the country; accordingly, about six thousand men, women, and children were carried away to the English colonies and scattered at various places from Massachusetts to Georgia. See NOVA SCOTIA.

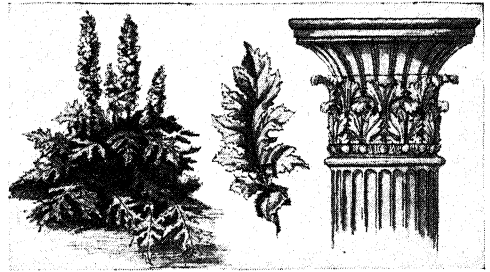
This melancholy chapter in the history of the Acadians has been treated poetically in Longfellow's well-loved epic, *Evangeline*, a poem which will preserve the name of Acadia so long as there are readers to appreciate its pathos and its beauty (see EVANGELINE). Interest in the tale centers about the sweet and loyal heroine, whose faithfulness to her lover is the theme of the poem. The author has expressed this fidelity in the familiar lines—

Ye who believe in affection that hopes, and endures,
and is patient,
Ye who believe in the beauty and strength of woman's
devotion,
List to the mournful tradition still sung by the pines
of the forest;
List to a tale of love in Acadie, home of the happy.

This poem is recommended to our readers for careful study.

ACADIE, *a ka' de*, the old name of Nova Scotia. See NOVA SCOTIA (History).

ACANTHUS, *a kan' thus*, a genus of plants or shrubs, most of which are but ordinary weeds, although several species form beautiful

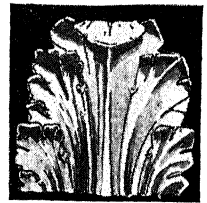


ACANTHUS

The plant, the conventionalized design adapted in architecture, and an example of its use in a column.

garden and hothouse plants. These latter, with their large, white flowers and deeply indented shining leaves, are tropical in habit, and will grow in the United States and lower Canada only if carefully protected.

In architecture the name is given to a kind of foliage decoration, much employed in Greek and Roman times, and later. The conventionalized form is the characteristic decoration of the capital in the Corinthian column, the richest and most ornamental type of Grecian architecture. See COLUMN.



Enlargement of the acanthus leaf as adapted in architectural designs.

A CAPELLA, *a ka pel' ah*, a form of chorus (which see).

ACARIDA, *a kair' i dah*. See MITES.

ACCAD, *ak' kad*. See BABYLONIA.

ACCELERATION. See FALLING BODIES; FORCE.

ACCENT, *ak' sent*. When a word of two or more syllables is pronounced, one is made more prominent than the others by means of special emphasis. This emphasis is called *accent*, and is indicated when words are being spelled to show their exact pronunciation, by the sign ' , placed after the stressed syllable. Some long words have more than one accent—in the word *examination*, for example, the syllables *am* and *na* receive more emphasis than the others. But there is always one accent which is stronger than the others, and this is known as the *primary* accent. In the word referred to above, *na* has the primary accent, that on *am* being *secondary*. Such a secondary stress is indicated by two marks, ' ' , or by one which is lighter than the primary accent mark.

The tendency in English is to place the accent as near the beginning of the word as ease of pronunciation will permit; in the case of the word *re voke'*, for example, the accent is shifted when it is incorporated in the word *irrev' ocale*. To this tendency is due the graduation in the evolution of the language which results in the

pronunciation of *Gloucester*, or of *Newton* (New Town), and similar words. Accents shift frequently, usually toward the first syllable of the word, in accord with the general tendency; the word *concentrate*, formerly accented on the second syllable, is to-day most commonly pronounced *con' centrate*. Borrowed words also undergo this change, as is the case with *senator* and *orator*, from the Latin; some words recently borrowed from the French retain their original pronunciation, as *ca price'*.

Accent, or emphasis, occurs in sentences as well as in words, and is used to express variations in meaning by stress on particular words. Thus, the sentence, "You walked down the avenue," may be made to express four different meanings, by stress on *you*, *walked*, *down*, and *avenue*.

[For accent in music, see the article entitled *MUSIC*.]

ACCESSORY, *ak ses' o rie*, in law, is a person who has some part in the perpetration of a crime, either before or after its commission, but is not present when the unlawful act is performed. One who aids prior to the act, or who has knowledge that it is impending and does nothing to prevent it, is an *accessory before the fact*; if he aids the active agent after the crime is committed, or has knowledge of it which he suppresses, he is an *accessory after the fact*. The latter charge does not apply to near relatives who harbor a person who has committed a felony.

An accessory is punishable with penalties which may be as heavy, in the discretion of the court, as those visited upon the one who actually commits the offense. A knowledge of facts with which a law-abiding citizen accidentally becomes familiar places an obligation upon him to assist in punishing law-breakers.

In *physiology*, accessory muscles are those that control the finer movements of the body.

ACCIDENTAL. See *MUSIC* (A Course of Lessons).

ACCIDENTAL PRESIDENT. See *VICE-PRESIDENT*; *TYLER, JOHN*; *FILLMORE, MILLARD*; *JOHNSON, ANDREW*; *ARTHUR, CHESTER ALAN*; *ROOSEVELT, THEODORE*; *COOLIDGE, CALVIN*.

ACCIDENT PREVENTION. One of the strongest of human instincts—possibly the strongest—is that of self-preservation. In the approach to adult life, caution is bred instinctively as a means of safety, yet habits thus acquired are often not wholly dependable because formed through paths of least resistance. A cautious man or woman is seldom injured except through momentary lack of concentration of thought or in the unexpected presence of an unusual circumstance whose consequences cannot be avoided.

Until within recent years, but little thought was given to means of accident prevention; the necessity for it was not apparent. But in due

course there developed a realization that the complexities of the social order were demanding too great a toll of human life; that safety precautions had not kept pace with modern progress—in city life, especially. The number of accidents each year, exclusive of those in the industries, began to reach appalling proportions—more than 20,000 deaths and at least 100,000 maimings due to the modern high-speed automobile alone, responsibility for which is divided between reckless drivers and incautious pedestrians.

It is not true that accident victims are in nearly every case children not yet arrived at the cautious age or adults with the minds of children, though the majority may fall within these classes. Adults of high intelligence fall victims, as well, through somebody's recklessness or because they momentarily abandon ordinary precautions in this increasingly complicated mechanical world. The accident-prevention problem, therefore, concerns all classes and all ages, and must be dealt with through education in safety measures and especially by surrounding people with standardized safeguards. Blind chance that one will emerge safely from an adventure must be eliminated by such means.

"New orders then must find new prudences,
And councils for the battle with Blind Chance
Must learn new words of sign and countersign."

School Instruction. The public schools have accepted safety education as a part of their duty to society. They have begun to teach habits which are automatically protective, not by installing new special classes but by judicious choice of devices applied to ordinary daily routine. A few of these activities are noted below:

Games. How to move with street traffic is shown by designating aisles in a schoolroom as streets, these meeting a wider street in the front of the room. A pupil is the traffic policeman. Children who become lost are taught what they should be able to disclose as means of identification—their names, addresses, telephone numbers, etc. They are taught in their play to realize that things left carelessly on the floor at home, as knives, matches, pins, may cause accidents.

Dramatization. Stories which contain lessons on safety are acted as realistically as possible. The *Pied Piper* is an example of danger from more than one angle. Tales which point out the duties of officials and citizens are good subjects for dramatization.

Art. Posters which illustrate dangers are becoming popular, and they carry a strong appeal.

Language. Many lessons may have for their subject common dangers which beset children. The right and wrong ways of meeting them may be developed.

Nature Study. It may be pointed out that protective coloration is nature's safety method in a good part of the animal world, while children must rely on reason and caution in emergencies.

Civics. The part of the local government which seeks to promote the health and well-being of the people should be stressed.

Physical Training. Muscular control and coordination are developed by systematic physical exercises.

There are many school "safety clubs" which affect tremendously the welfare of children. These maintain order, compel neatness on school grounds, and cleanliness in buildings. They assign pupils as student-aids to traffic officers, and children are made to recognize their authority. Fire and health departments and the offices of safety councils are visited, and useful information is secured. Surveys of the neighborhood are made to locate hazards to safety, and plans for their removal are carried out. They formulate rules for safety, report violations, and conduct pupil courts to try offenses.

Warnings Which Should Be Heeded. The National Safety Council has listed careless actions which are responsible for the majority of accidents:

Crossing a street without looking in each direction for vehicles.

Crossing a street against a "stop" sign.

Crossing a street diagonally or in the middle of the block.

Stepping into the street from behind a standing or moving vehicle.

Playing in the street.

Running into the street to recover a ball or a bat.

"Hopping" on trucks or other vehicles.

Holding on to a vehicle when on a bicycle or roller skates.

Failing to use signals when driving.

Riding on the handle bars of a bicycle.

Using tricycles, pushmobiles, or roller skates on the highway.

Coasting on streets crossed by street-car or railroad tracks.

Crossing in front of street cars.

Alighting from a street car with face to the rear of the car.

Holding an umbrella down over the face, shutting off the view ahead.

Standing on chairs or insecure stepladders.

Careless use of matches.

Careless disposal of ashes, oiled rags, and waste.

Improper use of kerosene and gasoline.

Bad habits of smokers in throwing away lighted cigarettes and cigars.

Walking on railroad tracks or trestles.

Failure of drivers of automobiles to stop at grade crossings.

Going into deep water if unable to swim.

Careless behavior in boats and canoes.

Handling of firearms when unnecessary.

Accidents in Industry. Injuries received in industry must be discussed from a viewpoint which differs radically from the social aspect of accident prevention. State laws recognize the liability both of employer and employee in their mutual relations. These are discussed in *THE WORLD BOOK* under the titles

LABOR LEGISLATION and EMPLOYERS' LIABILITY. See, also, NATIONAL SAFETY COUNCIL.

ACCLIMATIZATION, OR ACCLIMATION, the process by which a plant or animal adapts itself to a climate to which it is not accustomed. The best examples of acclimatization are the cultivated plants, like the potato, wheat, barley, and other cereals, and the common fruits; all of these are believed to have grown originally only in the warmer zones, but some of them now flourish almost to the polar regions. Although in most of these acclimatization seems perfected, yet certain limitations are always appearing; for instance, corn cannot be grown in the short, cool seasons of the northern temperate regions, while some kinds of wheat do not thrive as well in the warmer climates. There are many instances of partial acclimatization, where the plant may grow thriftily for a time but fail to mature fruit or to bear seeds.

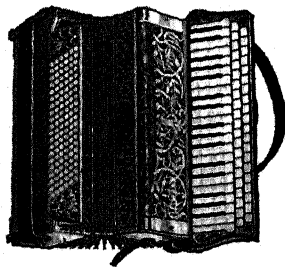
The ease with which some of the domestic animals have adapted themselves to the climates to which man has taken them has been an important factor in the spread of civilization and the growth of agriculture and industry. Change in climate sometimes affects neither vigor nor general health, but only size, as in the case of the Shetland pony. While the human race is very adaptable under most conditions, violent and sudden changes may be disastrous. The removal from a temperate to a tropical climate is a case in point. On the other hand, the danger in such a removal may be lessened by means of sanitary and hygienic measures. The Panama Canal Zone is now a very healthful place for northerners, whereas the Americans who first went there found it one of the "hottest, wettest, and most feverish regions in existence."

Of all races of men, the Anglo-Teutonic seems to be the most adaptable in respect to changes of climate. This trait has made it the greatest colonizing race of the world. R.H.W.

ACCOLADE, *ak' o layd*. See CHIVALRY.

ACCOMMODATION, in physiology. See EYE.

ACCORDION, an old-fashioned wind instrument, one of the smallest of such devices, consisting of a bellows of many folds, to which a keyboard is attached. The right hand plays the melody by pressing the keys, while the left hand opens and shuts the bellows, which causes the air to pass over a set of metal reeds, thus producing the musical sounds. The accordion



ACCORDION

LEARN SAFETY; AVOID SORROW



Avoid deep water
until you can swim



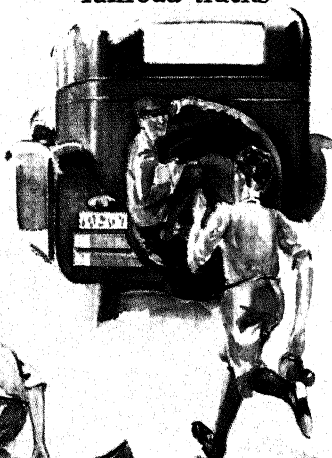
Never walk on
railroad tracks



Keep guns away
from children



Never
coast
in streets



Stealing rides
is dangerous



Keep away from
electric wires



Don't rock
the boat



Keep and use
inflammables
out of doors



The motorist owes
courtesy to pedestrians

is easy to play, and its music is favored at barn and country dances. It was invented in Vienna in 1829, but is similar to a wind instrument used by the Chinese for centuries. The concertina (which see) is an improved accordion.

ACCOUNTANCY is a profession, the members of which are skilled in the construction of systems of accounts and reports for various lines of business. Its members understand the principles of bookkeeping, and are qualified to audit, analyze, investigate, and interpret bookkeeping data.

Accounting is a subject which may be divided into four main divisions, or fields—constructive, recording, analytical, and interpretative.

Constructive accounting includes the designing of bookkeeping systems to meet the needs of individual businesses or groups. The systems designed may be forms, records, and accounts, to be used either for recording the general financial transactions of a concern or for obtaining the cost of products manufactured, or for both.

The second division of accounting—the recording of business transactions—is called bookkeeping (which see). The one who keeps the system of records and accounts designed by the professional accountant is called the bookkeeper.

The analytical division of accounting is usually called *auditing*, and for the most part consists of the verification of entries already made in the books of account. Investigations and examinations as to particular items or transactions, or the value of a business, are also included under the general term of auditing. See AUDITOR.

The interpretative division of accounting is one of the most important divisions, because it includes a study, analysis, and conclusion regarding the bookkeeping data and the reports compiled therefrom. The facts disclosed should serve as a basis for determining the future administrative policies of the concern in question.

A professional accountant should, of course, understand all branches of accounting; he should be able to design a system, make the entries therein, analyze the entries, and interpret the results. However, the professional accountant does not usually make the actual entries in the books nor interpret the results or reports obtained from such entries. The former is primarily the work of the bookkeeper, and the latter is primarily the work of the business executive.

Every student of business should understand the principles of accounting. A knowledge of how to keep records (bookkeeping) is one of the best means of approaching the general subject. Obviously, the student who intends to make accountancy his profession

uses his knowledge of bookkeeping as a stepping-stone to the broader field of accounting. It is equally important that the executive of a business should possess a knowledge of bookkeeping and accounting, although he may never be called upon to do all phases of the work. Too frequently business men are content to know only bookkeeping facts; so long as transactions are recorded in their books of account they are satisfied. They do not realize that the summarized bookkeeping facts for past periods indicate the result of the administrative policies in force during those periods, and that the executive who fails to utilize this information in deciding future policies deprives himself of one of the surest and safest methods of determining the most profitable path.

Accountants. Those who practice accountancy are of two kinds—private and public. The former give all their time to directing the accounts of one organization; the latter are at the service of all people. Their activities cover the various divisions of the subject of accounting; they also act as financial advisers and counselors and as arbitrators in business disputes.

A public accountant may be retained by the officers, directors, stockholders, bondholders, or creditors of a corporation to perform any of the activities mentioned above. His is a position of great trust and responsibility, for his work must deal with expressing, accurately and truthfully, the facts regarding any particular business. From one to thousands of interested people may rely upon the statements and report which he may issue regarding a business he has audited.

To protect the public against incompetency, all the states in America, and the Canadian provinces as well, require the passing of rigid examinations by those who desire to practice as certified public accountants in the United States or as chartered accountants in Canada. Such examinations usually cover the subjects of theory of accounts, auditing, practical accounting problems and procedure, commercial law, and governmental accounting. In the majority of states and provinces, the person examined must be a high-school graduate, or satisfy the examining board that he possesses an equivalent education, before the examiners will allow him to take the examination. In addition to this elementary educational requirement, the applicant for examination must present evidence of experience and training in accounting gained either through practice or advanced professional study, or both.

To be a successful public accountant, a man should be well versed in economics, finance, law, statistics, and mathematics. He should have a liking for analysis, for synthesis, and for

thoroughness, and he should possess the consciousness that his responsibility requires not only accuracy and honesty, but also constant alertness.

Cost Accounting. The purpose of cost accounting in a manufacturing business is to determine the cost of producing and selling a commodity. If the manufactured commodity cannot be sold at a profit, the manufacturer must decide whether he wishes to continue to make such articles or whether he will devote his plant to making other articles which may be sold at a profit.

The factory cost of, or the cost to produce, a manufactured commodity consists of—

- (1) The material which was used in making the article;
- (2) The labor which was spent directly upon the manufactured article;
- (3) A share of the indirect expenses of the factory which cannot be charged directly to any article.

These indirect expenses are usually called *factory burden*, or *overhead expense*, and consist of such items as indirect materials (oils, cotton waste, and other machinery supplies), indirect labor (salaries of janitor, foremen, and superintendents, who do not work on any one specific job), factory rent, heat, light, power, property taxes, wear and tear (or depreciation), insurance, repairs, and a share of the general administrative expenses of the business. The balance of the general administrative expenses of the business is included as an item of selling expense, and the distribution of the total selling expense over the articles sold is another one of the problems included in cost accounting.

Materials which are directly used in manufacturing an article may be accurately measured, weighed, or otherwise valued, and the cost of the labor directly spent in producing the article may also be accurately determined. The factory burden, or indirect expense, cannot be distributed directly to the article, and therefore various methods have been devised to make such distributions as equitably and fairly as possible under the varying conditions prevailing in different factories, or in different departments within the same factory.

Retail and wholesale dealers also have problems in cost accounting, but they consist mostly of distributing the various expenses, such as salesmen's salaries, rent, light, advertising, delivery expense, repairs, office salaries, stationery and office supplies, telephone and telegraph, etc., over the departments. Among the bases used by department stores, for example, are floor-space area, departmental sales, number of clerks, value of space occupied, average stock of merchandise carried, packages delivered and returned, value of equipment used, and number of charge transactions.

Without the help of cost accounting a business may continue for years to lose money on supposedly profitable articles, undertakings, or departments. The investigations of the United States Department of Agriculture are proving this particularly true in the case of farming.

Farm Accounting. The following is a brief outline of a method of determining the exact cost of any crop on the farm, and also illustrates the principles of cost accounting for any business. It is based on the recommendations of the United States government and will be better understood if read in connection with the article *BOOKKEEPING*, especially the section called *Farm Bookkeeping*.

Each crop must be charged with:

- (1) Items which enter directly into its cost, such as seed, insect-destroying chemicals, and fertilizer, whether they are products of the farm or purchases.
- (2) Labor of men. If the number of hours spent on each task is noted every day, and at the end of the year the total cost of labor (including a reasonable salary for the farmer) is divided by the number of hours which have been spent, the result will be the cost per hour. Of course, two men working one hour must be counted as one man working two hours.
- (3) Labor of horses. The expenses of the horse account will include feed, a reasonable charge for space in the barn, and man-labor for their care. If they are worth less at the end of the year than at the beginning, the difference is charged to the account. A year's interest on their value, and insurance and taxes on them, if any, are added. The account is credited for manure produced. The total cost of the horses for the year divided by the number of hours of work will give the cost per hour.
- (4) Machinery, equipment, and harness use. The cost of this account for the year is found, as in the case of horses, by charging materials, labor, interest, rent, insurance, depreciation, and taxes. It is important to charge adequate *depreciation*, or decrease in value. The number of hours by which the total is divided should not include hours in which equipment was employed for the benefit of other equipment, as, for instance, when harness and wagon are used in bringing new machinery to the farm.

- (5) Rent, hail insurance, depreciation, and taxes on the land used (in proportion to its fertility), and a share of the like costs for buildings and fences on the farm. F. H. E.

ACCUMULATOR. See *ELECTRICITY* (Electricity in Motion).

ACETANILID, as *et an' e lid*, a white, crystalline powder, used medicinally to deaden pain and allay fever. It is prescribed for headache, neuralgia, and the aches and pains of fever, but is not effective in the treatment of inflammatory ailments. Many headache powders on sale in drug stores contain this drug. Its habitual or indiscriminate use cannot be too strongly condemned. Overdoses have injurious effects on the blood and heart, and it is a dangerous medicine in any form for persons with heart disease. Acetanilid should be taken only as prescribed by a reliable physician.

Composition. The drug is a derivative of coal tar, and is a compound of carbon, hydrogen, nitrogen, and oxygen. It is odorless, slightly bitter, and dissolves readily in alcohol, ether, and chloroform.

ACETIC ACID, *a set' ik* (or *a set' ik*), in its pure and water-free state, is a colorless liquid, a little heavier than water. It has a very sharp odor and a painful action upon the nose and eyes. It is a caustic, that is to say, a substance which acts upon the skin, producing severe burns. When cooled to 62° F. (the temperature of a cool room), pure acetic acid solidifies into icelike crystals; for this reason pure acetic acid (even when liquid) is called glacial acetic acid. Dilute acetic acid, that is, acetic acid mixed with water, is cheaper than the glacial acid.

Acetic acid takes its name from the Latin *acetum*, meaning *vinegar*. It is this acid to which the sourness of vinegar is due. The interesting process by which acetic acid is formed from dilute alcohol is described under the title **VINEGAR**. Vinegar contains only from four to nine per cent of acetic acid. Concentrated acetic acid was first obtained from vinegar in the year 1700 by the German chemist Stahl. To-day it is made commercially from hardwood by distillation, being thus a by-product of the manufacture of charcoal (which see) and wood alcohol. The crude acid first obtained is called *pyroligneous* acid (from the Greek *pur*, meaning *fire*, and the Latin *lignum*, meaning *wood*). This crude acid is used to some extent in dyeing. The greater amount, however, is converted by chemical treatment into pure acetic acid.

Acetic acid is used extensively in the manufacture of *white lead*, *acetone*, and the *acetates*. Among the important acetates are those of lead, calcium, sodium, copper, aluminum, and iron. Lead acetate is *sugar of lead*. *Verdigris* (which see) is a copper acetate used in the manufacture of *Paris green*. The acetates of sodium, aluminum, and iron are used in dyeing.

T.B.J.

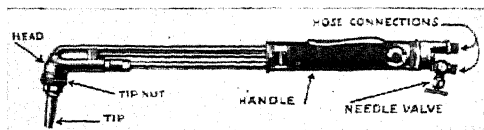
Chemical Formula. The formula for acetic acid is CH_3COOH . This shows that a molecule is made up of one atom of carbon, three atoms of hydrogen, and the carboxyl group COOH . The latter is a radical; that is, a combination of atoms which function in chemical structure as a single atomic group, and which may remain unchanged in a chemical reaction, and have the effect of a single atom.

ACETYL-SALICYLIC, *as' e til-sal i sil' ik*, **ACID**. See **ASPIRIN**.

ACETYLENE, *a set' i leen*, a clear, colorless gas, of great commercial importance for lighting purposes until recently; the widespread distribution of electricity is gradually displacing it. It ignites easily, and burns with a bright but smoky flame. Ordinarily the gas has a peculiar odor, somewhat like that of garlic, but when burning it has no odor.

It was once largely used for automobile and bicycle lamps, and also much employed in illuminating country houses.

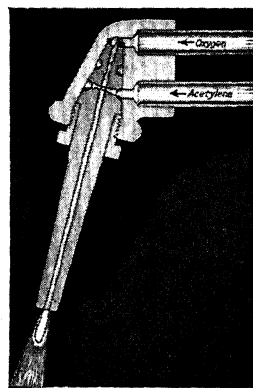
Acetylene gas was formerly regarded as dangerous, but actually it is less poisonous than ordinary illuminating gas, and, if handled with reasonable care, is not more likely to



OXY-ACETYLENE TORCH

explode. The smoke of the acetylene flame is eliminated by using a special burner, designed on a principle not previously employed in lighting. There are two small openings, from which the gas issues and mingles with the air. The acetylene burners used in house-lighting consume about seven-tenths of a cubic foot per hour, and give a light of about twenty candle power. The cost of this light is about three-fourths that of ordinary illuminating gas.

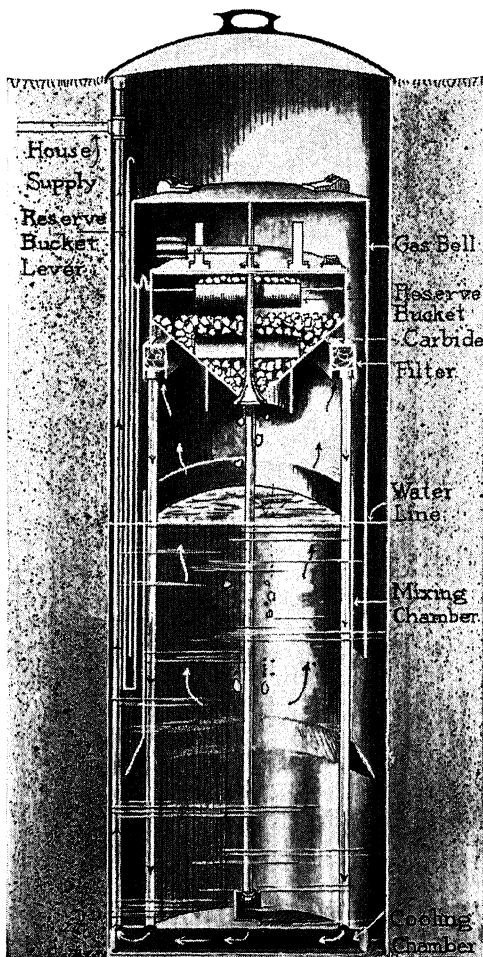
Manufacture of Acetylene Gas. The cheapness of this gas is due chiefly to the simplicity of its manufacture. Chemically it is composed of carbon and hydrogen, and it is produced by the action of water on calcium carbide. When calcium carbide is placed in contact with water, the hydrogen of the water unites with the carbon of the calcium carbide to form acetylene gas. A pound of commercial calcium carbide yields about 4.5 cubic feet of acetylene gas. Calcium carbide can now be purchased by consumers, who are enabled to make illuminating gas on their own premises. A reservoir to contain the calcium carbide, another for water, and an arrangement for mixing the two are the only requirements.

ACETYLENE TORCH
Cross-section of mixing head.

A reservoir to contain the calcium carbide, another for water, and an arrangement for mixing the two are the only requirements.

Manufacture of Calcium Carbide. Calcium carbide, as now used for commercial purposes, is the product of the electrical fusion of coal dust and lime in the proportion of one pound of coal dust to 1.5486 pounds of lime. The result of the fusion of this quantity is 1.77 pounds of a dark gray, cinderlike substance. The lumps of this substance, which is called

carbide of calcium or calcium carbide, are brittle and crystalline. At first they have a lustrous surface, but after a short exposure to air they become tarnished. The present method of manufacture was perfected about 1892 by Thomas L. Willson, a Canadian scientist.



Cross-section of underground tank for supplying acetylene gas to a residence requiring a large number of lights. Besides the house, such a tank will generate sufficient gas to supply the barn and other outbuildings. Plants of this nature are popular in rural communities, where electric light or illuminating gas is not available.

Acetylene Welders and Cutters. The flame of acetylene gas, when burning in pure oxygen, is even hotter than that of hydrogen burning in oxygen (see HYDROGEN). The oxy-acetylene flame, that is, acetylene burning in oxygen, has been found well adapted to the purpose of welding metals. It is also extensively used, in a torch which concentrates the flame, for cutting or burning through metal. A thin threadlike flame is directed at the point where the cut is wanted, and burns its way

through the hardest metals as though they were cut by a saw. T.B.J.

Chemical Formula. Acetylene has the formula C_2H_2 . This means that each molecule consists of two atoms of carbon and two atoms of hydrogen.

ACHAEANS, *a kee' anz*, the early inhabitants of Southeastern Thessaly and a part of the Peloponnesus, who formed one of the four groups of ancient Greeks. After the Dorian invasion they pushed into Northwestern Greece, where they formed the *Achaean League*, a confederation of the twelve towns of that region. The power of the League waned after the death of Alexander the Great. It was revived in 280 B.C. and later spread over the whole of Greece, lasting until 146 B.C., when it was destroyed by the Romans. The term *Achaia*, or *Achaea*, was used by Horace to designate the whole of Greece. The Achaeans received their name from their mythological ancestor, Achaeus, the grandson of Hellen, son of Deucalion (which see). C.W.

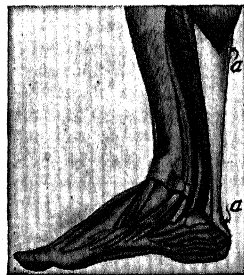
Related Subjects. The reader is referred in these volumes to the following articles:

Aeolians	Ionians
Greece	Sparta

ACHATES, *a ka' teez*, one of the Trojans who followed Aeneas and remained with him through all his wanderings and his struggles after the hurried flight from Troy (see TROY). He was so devoted to Aeneas and so constant that he was always called *fidus* (faithful), and the expression *fidus Achates* has come to be a common one for a very faithful friend. Scott used the term in the sentence, "He has chosen this fellow for his *fidus Achates*."

ACHERON, *ak' e ron*, the name applied in ancient times to a number of rivers in Greece and Italy. In Homer's epics there is mention of a river in the underworld by the name; the poet is said to have taken it from that of a river in Epirus which flows into the Ionian Sea. In later mythology, Acheron is a river or lake in Pluto's realm, across which Charon ferried the souls of the departed. See CHARON; PLUTO.

ACHILLES, *a kil' eez*, in Greek legend, one of the great leaders in the Trojan War. The *Iliad* opens with account of the wrath of this hero—"ruinous wrath, which laid unnumbered woes on the Grecians." He was the son of Peleus and the sea-goddess Thetis. Having been well trained in the arts of war, when the Trojan War began he joined the Greek army, and during the early years of that



TENDON OF ACHILLES
Shown at a.

struggle was of great assistance to the Greeks. However, when Agamemnon, leader of the expedition, took Briseis, a captive maiden whom Achilles greatly desired, the latter refused further aid in conflict, and the Greeks soon were in desperate straits. Only the death of his beloved friend and kinsman Patroclus, who was killed in action against the Trojans,



AN INCIDENT OF THE TROJAN WAR
Briseis, the captive maiden, taken from Achilles.

made Achilles forget his personal grievances. Filled with the desire for revenge, he rejoined his warring countrymen and turned the tide of their fortunes by slaying Hector, the bravest of the Trojans. According to the early myth-writers, Achilles had been dipped by his mother in the Styx, which made invulnerable every part of his body except his heel, by which she held him. He received his death-wound in this heel, from an arrow shot by Paris, son of Priam, king of Troy.

Tendon of Achilles. Because it was by the heel that this Greek hero was held, the strong tendon which connects the muscles of the calf with the heel is known as the *tendon of Achilles*. It may be easily felt just above the heel.

Related Subjects. The reader is referred in these volumes to the following articles:

Hector	Priam	Troy
Iliad	Styx	Ulysses

ACHROITE, *ak' ro ite*. See TOURMALINE.

ACHROMATIC LENS, *ak ro mat' ik lenz*. See ABERRATION (Chromatic Aberration).

ACID, *as' id*, any one of a number of chemical compounds having more or less the qualities of vinegar. The general properties

assigned to them are a tart, sour taste, the power of changing a vegetable blue called *litmus* into red, of acting upon and dissolving metals, and of being rendered neutral by alkalies.

Blue litmus is made from a kind of lichen which grows on the seacoasts of Europe. It is supposed that the change from blue to red which the litmus undergoes when treated with an acid is due to a change in the relative position of the atoms in one of the chemical compounds contained in the litmus. An acid always contains hydrogen, and it is always possible to take the hydrogen from an acid and replace it with a metal; the result of this process is the production of a *salt*. An instance of a hydrogen compound that is not an acid is water, which is composed of hydrogen and oxygen. However, when hydrogen and chlorine combine, the product is an acid, *hydrochloric acid*; for the hydrogen can be replaced by such a metal as sodium, and *sodium chloride* is produced. The latter is what every child knows as common salt.

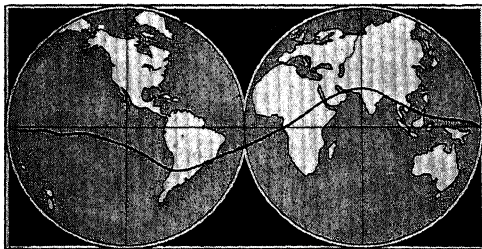
Many acids are harmless if taken internally, while others, themselves compounds of elements that cannot do harm, are deadly poisons. When we eat oranges or lemons we swallow citric acid. Grapes contain tartaric acid; apples, malic acid; and vinegar, acetic acid. All of these are harmless, but oxalic acid and carbolic acid, although made up of the same elements as the others—namely, carbon, hydrogen, and oxygen—are deadly poisons. Sulphuric acid, nitric acid, and hydrochloric acid are manufactured on a large scale, and are very useful products in manufactures and elsewhere.

T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Acetic Acid	Nitric Acid
Alkali	Oxalic Acid
Carbolic Acid	Phosphoric Acid
Chemistry	Picric Acid
Citric Acid	Prussic Acid
Hydrofluoric Acid	Salicylic Acid
Hydrogen	Salt
Hydrogen Chloride	Sulphuric Acid
Litmus	Tartaric Acid

ACKNOWLEDGMENT. See DEED.



ACLINIC LINE

ACLINIC, *a klin' ik*, **LINE**, OR **MAGNETIC EQUATOR**, an imaginary irregularly curved

line circling the earth in the neighborhood of the geographical equator. This line marks the zero point, or perfect balance, in magnetic attraction between the north and south magnetic poles. At all points along this line the magnetic needle always will balance itself horizontally, having no dip. See DIPPING NEEDLE; MAGNET AND MAGNETISM. R.H.W.

ACNE, *ak ne*, a disease of the skin originating in the oil glands and appearing especially on the face, the neck, and the back. It starts as a blackhead, or comedon. The blackhead is due to dirt absorbed by the grease. Pus-producing bacteria located in the grease and walls of the grease glands cause inflamed areas termed *pimples*; these may progress to form small abscesses, and scarring may result. Acne seldom develops prior to puberty. It is most troublesome in youth and in adolescence, affecting both boys and girls.

Blackheads due to accumulation of dried grease in the glands develop at all age periods, but infection of these disturbed glands is seldom troublesome after about age twenty-five. Acne is therefore rare among married men and women, and among men and women thirty years old and over, whether married or single. It is an age-limited skin disease. Keeping the skin very clear and the grease glands very active is of some service in preventing and in curing acne. The skin can be kept clear by the free use of soap and water, cleansing creams, and other cleansing agents. Work and exercise which cause the face to flush and sweat and grease to pour out on the skin are preventives of acne. Exposure to cold, to rain, and to snow act as preventives by causing flushing of the skin capillaries and an outpouring of grease from the grease glands. When the grease glands do not empty themselves and blackheads form, they should be squeezed out, but this should be done with care, lest infection with pus bacteria be promoted. See SKIN. W.A.E.

ACONCAGUA, *ah kon' kah gua*, an extinct, craterless volcano in Argentina, in the southern part of the Andes Mountains. It is the highest mountain in America, its height being 23,080 feet. A river of the same name, 200 miles in length, rises on the southern slope of the mountain and enters the Pacific Ocean twelve miles north of Valparaiso, Chile.

ACONITE, *ah' o nite*, the common name of a genus of hardy plants belonging to the buttercup family (see BUTTERCUP), consisting of sixty to seventy species. They have poisonous roots, leaves, and seeds, but some of them are cultivated as ornamentals, as they are showy plants. The flowers, blue, white, or yellow in color, bear sepals of unequal size and shape, the upper one having the form of a hood. From this peculiarity arises another common name, *monkshood*. One species in particular is

the source of the drug aconite, containing the alkaloid *aconitin*. This very powerful medicine is used as a tincture and as a liniment. The tincture has powerful effects on the heart and the breathing centers, and should never be taken except as prescribed by a reliable physician. The liniment is used to deaden pain in ailments such as neuralgia and rheumatism. Because of its poisonous properties, it is never safe to apply it if there are cuts or breaks in the skin. B.M.D.

Scientific Name. The aconites are members of the family *Ranunculaceae*. The species whose root furnishes the drug described above is *Aconitum napellus*.

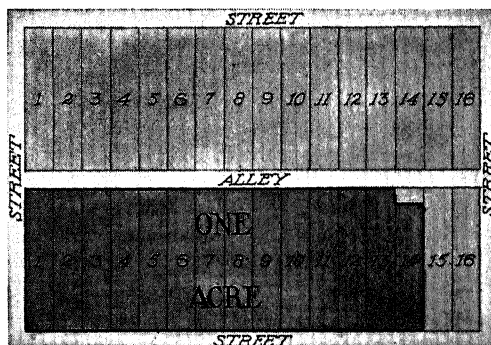
ACONITIN, *a kon' i tin*. See ACONITE.

ACORN, *a' korn*, or *a' kurn*. See OAK.

ACOUSTICS, *a kow' stiks*, or *a koo' stiks*, from a Greek word meaning to hear, is a term applied to that quality of a room or hall which determines how easily sounds produced in it may be heard. A room containing large, smooth surfaces on the walls, floor, or ceiling is said to have had acoustic quality, because these surfaces reflect successive sound waves sent out by a speaker's voice, so that the words overlap and confusion results (see ECHO).

Besides reflection and echoing, designers of audience rooms must take into consideration the absorbing power of the materials used for walls, floor, and ceiling, the furnishings, the heating and ventilating apparatus, which give rise to air currents, the volume of the room, and the average number of persons in the audience. See SOUND; PHYSICS. A.L.F.

ACRE, *a' kur*, a measure of land consisting of 160 square rods, 4,840 square yards, or 43,560 square feet. In the English system, a square



In terms that a city child will grasp quickly, an acre of land is contained in nearly fourteen city lots each 25x125 feet.

of land approximately 208.7 feet in each direction is equivalent to an acre; in the metric system (which see), one hectare is equal to 2.471 acres. The acre used by English-speaking peoples is called the *Imperial acre*. J.W.V.

ACRE, *ah' kur*, a city of antiquity, in Palestine (which see).

ACROPOLIS, in ancient Greece, the fortified or religious center of a city. Originally the acropolis was the highest point in a district. Some hill or other easily fortified height was selected as a place of refuge, and fortifications were usually added; here the chief of a tribe lived. In time it reached the importance of small settlements, and finally cities appeared at the foot of the acropolis. When people began to fortify the city, it was no longer necessary to preserve the acropolis as a fortress, and it became customary to erect there the temples of the most sacred cults. The acropolis at Athens, which is the best example of this change, contained some of the most beautiful buildings in the world. Among them were the Parthenon, Erechtheum, Temple of Nike Apteros, Propylaea, and Theseum, all described in these volumes. For further details, see **ATHENS**.

Derivation. The word *acropolis* is a compound of the Greek *akros*, meaning *highest*, and *polis*, meaning *city*.

ACROS/TIC, as generally used, means a poem of which the first letters of the lines, taken in order, spell some name or other common word, or even a motto or a sentence. Strictly speaking, the content of the verse should deal with the subject given in these initial letters; if it does not, the acrostic is faulty and loses its chief charm. The following is a simple example:

Vying with the arbutus for modesty and grace,
Innocent as gleeful smiles on happy childhood's face—
Other flowers demand our love and entrance to
our thought—
Love seeks her in her hiding place and spends it-
self unsought.
Early springtime blossom in your modest garb of
blue,
Think not that summer's gorgeous bloom can steal
our love from you.

Many acrostics are far more elaborate than this, for some form words with their last as well as their first letters, or have some name "running down like a seam through the middle." Formerly the making of these was a popular pastime, and poets of note did not hesitate to try their hand at it; but acrostics have never stood high in the poetic scale, and to-day no real poet wastes his time upon them. For the most part they have been banished to the puzzle department of magazines.

In Hebrew poetry, the name *acrostic* was given to a poem of which the initial letters of the lines or stanza gave the names of letters of the alphabet in their order. The most noted of such poems is *Psalm* CXIX, of which the verses of the first division all begin with the first letter of the alphabet, those of the second

with the second letter, and so on until all the letters have been used.

ACTAEON, *ak' te' on*, according to Greek mythology a great hunter and a worshiper of the goddess Diana. Having by chance come upon the virgin goddess while she was bathing, for his boldness he was changed by her into a stag, despite his protests of innocence. His dogs, not recognizing him, set upon him and tore him to pieces. See **DIANA**; **MYTHOLOGY**.

ACTINOMY-COSIS, *ak' ti no mi-ko' sis*, a parasitic disease. See **PARASITIC DISEASES**.

ACTIUM, *ak'-shi um* (now **AKRI**), a headland or promontory on the coast of Greece, dividing the Gulf of Arta from the Ionian Sea. It is famed in history as the scene of a great naval battle, in 31 B.C., in which Octavian, later known as Augustus Caesar, gained a victory over Antony and Cleopatra. Cleopatra's fleet was being held in reserve and had not been engaged in battle, when an unexpected maneuver of Octavian made his victory probable. The queen, instead of coming to Antony's aid, ordered her ships to flee. Thereupon Antony himself deserted his fleet and followed her. The leaderless fleet fought bravely, but was finally overcome. See **ANTONY**; **CLEOPATRA**; **AUGUSTUS**.

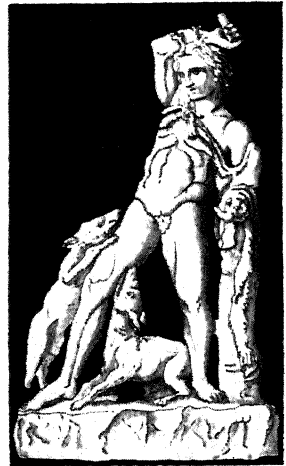
ACT OF SUPREMACY. See **HENRY (VIII, England)**.

ACT OF UNION. See **UNION, ACT OF**.

ACT OF UNION (1801). See **IRELAND (History: The Struggle for Better Conditions)**.

ACTS OF THE APOSTLES, the fifth book of the New Testament, written by Luke to form a sequel to his Gospel. In it he gives a history of the foundation and growth of the Christian Church, from its small beginning in Judea on the Day of Pentecost up to the time when Paul introduced it into Asia Minor, Greece, and Rome. He describes the persecution of the sect as the Church grew in size, until they fled from Judea into Samaria and Syria, taking their new religion with them and spreading it. Later the church at Antioch grew to be the headquarters from which Paul worked into the wider field. See **PENTECOST**; **PAUL**.

ADAGIO, *a dah' je o*. See **MUSIC (A Course of Lessons)**.



ACTAEON AND HIS DOGS
From a statue which is in the possession of the British Museum, London.

ADAM AND EVE. In the Biblical story of the Creation, recounted in the book of *Genesis*, it is told that God created as the first parents of the human race two beings who were called Adam and Eve. In this narrative, Eve was created as a helpmate for Adam, out of one of his ribs, and the two lived in the beautiful Garden of Eden to keep guard over it. Tempted by the Evil One, in the form of a serpent, to eat of the forbidden "tree of the knowledge of good and evil," they fell from grace and were driven by the Lord from the Garden. Adam is recorded as dying at the age of 930, leaving numerous descendants; there is not the slightest evidence as to the age of Eve at her death. Among the sons of Adam and Eve, Cain, Abel, and Seth are specifically mentioned. See **CAIN**; **ABEL**.

ADAMS, ABIGAIL SMITH, wife of President John Adams (which see).

ADAMS, CHARLES FRANCIS (1807-1886), an American diplomat and political leader, son of John Quincy Adams. As minister to Great Britain from 1861 to 1868, he earned for himself a place in American diplomacy second only to that of Benjamin Franklin. Largely through his efforts, Great Britain and France refrained from giving recognition to the Confederate States. He was born in Boston, but his boyhood was spent in Russia and England, where

his father was United States minister. Soon after his graduation from Harvard College in 1825, he was the recognized leader of the New England Whigs, and in 1848 was nominated by the Free Soil party for Vice-President on the ticket with Martin Van Buren, but was defeated for election. In 1871 he represented the United States in the settlement of the Alabama Claims (see **ALABAMA, THE**), and in the next year he took a leading part in organizing the Liberal Republicans. See **WAR OF SECESSION**.

ADAMS, FRANK DAWSON (1859-), a Canadian geologist and educator, known especially for his researches on metamorphism and the older crystalline rocks of the earth. He was born at Montreal, where he attended high school and McGill University; later he studied at Yale University and at Heidelberg, Germany, where in 1892 he received the degree of Doctor of Philosophy. A year later he was appointed professor of geology at McGill University and became dean of the faculty of applied science in 1908. He became president of the Royal Society of Canada in 1914, and of the Geological Society of America in 1916. Dean Adams published numerous special reports on the geology of the Canadian provinces; they are regarded as authoritative documents on the subject.



ADAMS, JOHN (1735-1826), second President of the United States and one of the foremost of that group of American statesmen who gave themselves in full devotion to the cause of independence and the upbuilding of the new nation. The impress which he left on his country is the more remarkable because he was personally not popular. He was noticeably lacking in the magnetic qualities which made his second cousin, Samuel Adams, an admired leader. John Adams was a brilliant constitutional lawyer, possessed of great moral courage, and devoted with all his soul to the cause of the colonies. On the other hand, he was nervous, impetuous, generally tactless, vain of his ability, and inclined to think overwell of his own opinions.

His friends, his enemies, and those who held neutral ground did not allow these faults to outweigh his real merits. A weaker man than he would have been ruined by his stand in 1770, when he felt it his duty to defend the British

soldiers who were being tried for murder after the Boston Massacre, but in the very same year he was elected to the colonial legislature. Many years later, as President, he gave another example of courage when he determined, at all costs, to preserve peace with France. His policy made him probably the most disliked man in the United States; yet he himself felt that this was the greatest service he had ever rendered to his country and he desired "no other inscription over my grave than this: 'Here lies John Adams, who took upon himself the responsibility of the peace with France in 1800.'"

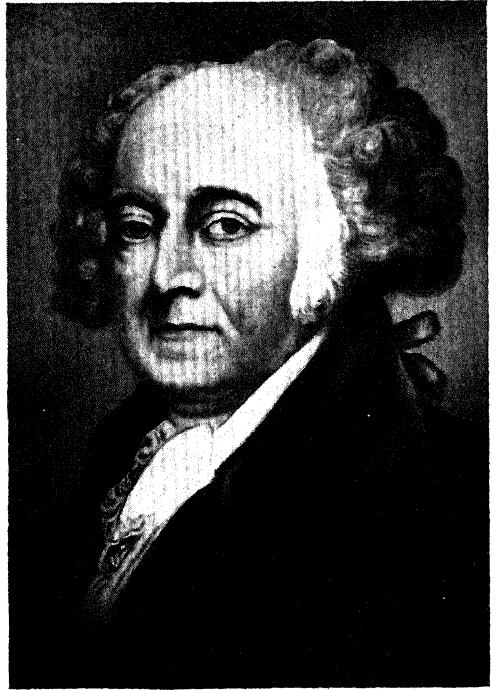
His Public Career. John Adams was born at Quincy, Mass., on October 31, 1735. His Puritan great-grandfather had left Devonshire, England, in 1636, and had settled on a forty-acre tract on the site of the town of Quincy. The Adams family prospered, although its members never pretended to be anything but hard-working farmers. It was the family cus-

tom to send the sons to Harvard College, from which the future President was graduated in 1755. He stood fourteenth in a class of twenty-four; in those days the ranking indicated not scholarship but social position. The Adams family seemed to think that he should study for the ministry, but John was too liberal for the pulpit of his day and preferred the law. In 1758, being then twenty-three years old, he began to practice in Braintree, but ten years later moved to Boston. In the meantime he had married Abigail Smith, a woman of great charm and ability, who gave him courage and advice at every critical point in his life (see subhead, *Abigail Smith Adams*).

Shortly after his marriage he began to appear in public affairs. When the Stamp Act of 1765 was passed, he presented resolutions against it at the Braintree town meeting. These resolutions, without the change of a word, were later adopted by more than forty Massachusetts towns; moreover, a little later they led to his selection as one of the lawyers to present a memorial against the act to Governor Bernard. Adams made the bold argument that the Stamp Act was necessarily null and void, because the colonists had taken no part in passing it. The repeal of the act ended Adams' public activity for a brief time, but his reputation was established. He was soon offered the position of advocate-general in the Massachusetts admiralty court, but he interpreted the offer as an attempt to put him in such a position that he could not freely oppose the British policy, and he refused the office.

In spite of his defense of the British soldiers who took part in the Boston Massacre, he was trusted by the patriot leaders, and on all legal matters he was constantly consulted by John Hancock, Joseph Warren, and Samuel Adams. For a year or two there was quiet in Boston and the vicinity, but in 1774 the passage of the five Intolerable Acts rekindled the flames of opposition to Britain. John Adams, with four others from Massachusetts, was chosen as a delegate to the First Continental Congress. Here his influence was great, and its resolutions concerning the rights of the colonies were the work of his pen. In the Second Congress he was one of the most ardent advocates of independence. John Fiske, one of the great authorities on this period, said that of all the delegates, John Adams, with the exception of his cousin Samuel, was "probably the only one who was convinced that matters had gone too far for any reconciliation with the mother country." Almost entirely through his efforts, Congress adopted the 16,000 minutemen of New England as the "continental army," and chose George Washington of Virginia as commander in chief. Congress and Virginia were thus committed to a plan which must end in independence or in tremendous disaster.

On June 7, 1776, Richard Henry Lee presented to Congress the resolution that "these colonies are, and of a right ought to be, free and independent states." Adams seconded the motion, and on July 1, when it was discussed by Congress, he defended it in what was probably the greatest speech of his life. Jefferson called him "the colossus of that debate." Adams was one of the committee appointed to draft a declaration of independence; the document was written by Jefferson, but no man did more to secure its adoption than Adams. For two years more Adams sat in Congress. He was a member of several important



JOHN ADAMS

Diplomat, first Vice-President, and second President of the United States; father of the sixth President.

committees, and was chairman of the Board of War and Ordnance.

Adams as Diplomat. To the year above noted Adams had served his country at home, but for the ten years after 1778 his work was in Europe. He was sent to France early in that year to take the place of one of the three commissioners who were negotiating for an alliance, but the treaty was already signed before he arrived in Paris. On reaching there he found endless confusion in the commission's affairs, which shocked his methodical soul. As the result of his recommendations to Congress, the commission was abolished. Franklin, however, was left in Paris as minister, and

Arthur Lee, the third commissioner, was ordered to Madrid.

Adams, left without instructions, sailed for home, where he was immediately elected to the convention which framed the Massachusetts constitution of 1780. This constitution, which is still the fundamental law of that state, was almost wholly the work of James Bowdoin and Samuel and John Adams. Before the constitution was adopted, Adams was ordered back to France to treat for peace, but Great Britain was as yet unwilling to end the struggle. Adams was then asked by Congress to secure



BRONZE TABLET IN WORCESTER, MASS.

The inscription bears these words: "In front of this tablet stood the first schoolhouse in Worcester, where John Adams, second President of the United States, taught 1755-1758."

a loan from Holland. He was successful not merely in this respect, but also in obtaining from the Dutch government recognition of American independence and a "treaty of amity and commerce."

Adams' presence was next demanded in Paris, where negotiations for peace were under way. Adams and Jay, two of the commissioners, believed that the French government was prepared to sacrifice the United States to Spain's interests in the Mississippi Valley, and they secretly carried on private negotiations with Great Britain, although they plainly violated their instructions. Thanks to their efforts, the treaty was finally signed was particularly favorable to the new nation. Adams was next appointed one of the commissioners for the

purpose of negotiating commercial treaties with foreign powers, and in 1785 became the first United States minister to Great Britain. Here in his independent manner, added to the fact that relations between the former colonies and the mother country were none too cordial, made his position burdensome, and finally, in 1788, he asked to be recalled.

As Vice-President. Adams had been at home only a few months when he was elected the first Vice-President of the United States. Washington received sixty-nine electoral votes and Adams thirty-four. The latter was noticeably chagrined at the decided preference shown for Washington, and to the end of his days he could never understand why Washington's services to his country were counted greater than his own. Throughout the eight years of his Vice-Presidency, however, he put aside personal jealousies whenever questions of principle arose, and on more than one occasion his deciding vote in the Senate saved the plans of Washington and his Cabinet from defeat. When Washington refused to serve a third term, Adams was his logical successor, and was elected. Jefferson, his political opponent, received sixty-eight votes, only three fewer than Adams, and, under the Constitution as it then existed, became Vice-President.

The Administration of John Adams (1797-1801). The four years during which Adams was President were among the stormiest in the history of the United States. During the entire period the Federalist party was split into two sections, one owing allegiance to Adams, one to Alexander Hamilton. Hamilton, though probably the ablest member of the party, was not so generally and favorably known as Adams. The latter, therefore, was given the Presidency, but Hamilton tried by various schemes to prevent his election and reelection. The feud between the two men became increasingly bitter as time went on. The members of Adams' Cabinet, it is said, even made reports to Hamilton and took orders from him rather than from Adams.

Besides the quarrels in his own party, Adams faced the violent opposition of Jefferson and the Republicans, who were French sympathizers. Adams saw no good in the French Revolution; his aristocratic temperament placed no trust in the mass of the people, and he saw only anarchy in the thrilling events in France. The Jeffersonians not only sympathized with the Revolutionary movement, but they were willing to fight for France against England. The Federalists, on the other hand, regarded every insult from France as a just reason for helping England.

Adams determined to keep the United States strictly neutral, and one of his first acts was to call Congress in special session to consider means of keeping peace. Congress sent three

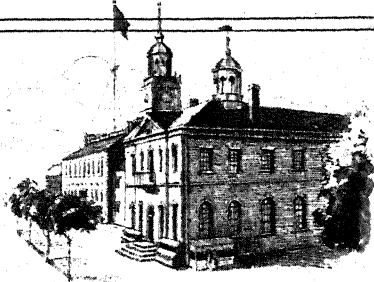
commissioners, C. C. Pinckney, John Marshall, and Elbridge Gerry, to Paris to negotiate with the Directory, which was then the government of France. Talleyrand refused to receive them openly, but secretly sent three envoys, called in the despatches X., Y., and Z., to treat with them. The envoys proposed that the United States should pay Talleyrand and two or three others large sums for the privilege of revising the treaties with France. The commissioners, in utter disgust, broke off the negotiations. When the reasons for their failure became known, the United States was ablaze with wrath, and the cry, "Millions for defense, but not one cent for tribute," rang through the land. Preparations for war were made, an army was quickly raised, Washington was recalled from Mount Vernon to take command, and a few naval battles were actually fought, the most notable being the sinking of the French frigate *La Vengeance* by the *Constellation*.

Though Adams hated the French Revolution and all that it stood for, he was equally opposed to war with France. The popular clamor only strengthened his resolve to keep peace and to meet France at least halfway. When Talleyrand found that his policy was threatening to drive the United States into alliance with Great Britain, he intimated his willingness to come to terms and to deal with three new commissioners appointed by Adams. Before these three reached Paris the Directory had been overthrown, but they adjusted all difficulties with Napoleon, who had become First Consul. The appointment of this commission, which Adams had chosen without informing his Cabinet, completed the breach in the Federalist party and endangered the reelection of Adams.

Now that war had been averted, another affair contributed to the end of the Federalist party. In 1798, while the war excitement was at its height, Congress had passed the Alien and Sedition Laws. These acts, promoted by the Federalists, were really in violation of the constitutional rights of freedom of speech and freedom of the press. They called forth the famous Kentucky and Virginia Resolutions, in which the doctrine of nullification was first stated. Here was the first sign of the struggle over states' rights, which later nearly split the Union into two sections.

In the election of 1800 the Federalists voted for Adams and C. C. Pinckney; the former received sixty-five votes, the latter sixty-four. Burr and Jefferson, the Republican candidates, each received seventy-three votes. Since there was a tie between these two, in accordance with the Constitution the election devolved upon the House of Representatives, which chose Jefferson as President and Burr as Vice-President. Adams refrained from any participation in the

ADMINISTRATION OF 1797-JOHN ADAMS-1801



Congress Hall, Philadelphia
Capitol, 1790-1800.

ALIEN LAW

The president could expel from the country any foreigner whom he deemed injurious to the United States.



"Millions for defense
but not one cent
for tribute"

SEDITION LAW

Anyone libeling Congress, the President or the Government could be fined or imprisoned.

KENTUCKY AND VIRGINIA RESOLUTIONS

Declared the Alien and Sedition Laws unconstitutional. Asserted the doctrine of States Rights.



John Marshall
Appointed Chief Justice



Washington Died in 1799

bargaining which led to this result. One of his last official acts as President was the appointment of John Marshall as Chief Justice of the Supreme Court.

Old Age. Adams was nearly sixty-six at the end of his term. He retired to private life feeling that his failure to secure reelection was a disgrace. He was so bitter and enraged that he refused to remain in Washington for the inauguration of his successor, but hurried off in his coach on the morning of March 4, 1801. For twenty-five years he lived quietly at his old home in Quincy, emerging from his retirement in 1820, when he was chosen a delegate to the convention for revising the Massachusetts constitution. For many years the bitterness of his defeat in 1800 remained, but its sting was partly removed when he saw his son, John Quincy Adams, elected as the sixth President. John Adams died on July 4, 1826, the fiftieth anniversary of the signing of the Declaration of Independence. On the same day, and only a few hours earlier, Thomas Jefferson breathed his last. Once bitter enemies, in old age the two men had become good friends, and Adams' last words were, "Thomas Jefferson still survives." Adams died in his ninety-first year, the greatest age attained by any President.

A.B.H.

Abigail Smith Adams (1744-1818) was destined to become the first mistress of the White House and a member of possibly the most illustrious family in American political history, by her marriage to John Adams in 1764.

She was the daughter of William Smith, a New England clergyman of good Puritan stock. Her formal education was slight, for her health was delicate, and the education of girls was no great concern of colonial days. But her association with learned people, her own keen, quick-witted mind and her extensive reading made her one of the most alert, intelligent women of her day.



Photo: U & U

ABIGAIL SMITH ADAMS

All of the courage of brave Revolutionary women was exemplified in Abigail Adams. Her husband's long absences during the war, and the mission to France which kept him away from her for four years, left her in her Massachusetts home caring for their five children and their estate, often in immediate peril from pestilence or marauders. At last, in 1784, she joined him in France, and later accompanied him to London, where she spent three difficult years as a representative from the new "upstart" nation.

Abigail Adams presided over the new White House in Washington for only a few months at the close of the Adams administration. Her description of the barnlike, uncompleted structure, with

the great East Room in which she hung the family wash to dry, occurs in one of her letters, which are preserved as delightful, valuable pictures of the social and political life of her time.

She lived to see her son, John Quincy Adams, appointed Secretary of State, but died seven years before he became the sixth President of the United States.

Other Items of Interest. Adams was the only President whose son attained the same high honor.

When Adams declared the Stamp Act null and void (see page 25) he voiced openly for the first time the colonial view that "taxation without representation is tyranny."

The popular nickname of Adams was "The Firm Federalist."

The treaty of 1783, with the negotiation of which Adams had much to do, is called by a competent authority "one of the most brilliant triumphs of modern diplomacy."

During his term as President, his portrait was painted by the famous Gilbert Stuart, who painted so many of the great men of the Revolutionary period.

It was during his administration that the seat of government was moved from New York to Washington.

The death of Washington occurred while Adams was in the Presidential chair.

The first pronouncement in favor of state's rights is found in the Kentucky and Virginia Resolutions (which see).

The Department of the Navy was created during his term of office.

The French called him the "Washington of Negotiations."

Adams continued his judiciary appointments up to midnight of the last day of his term of office, and even left some commissions undelivered on the executive table. These Jefferson, his successor, set aside.

It was during the period of tension with France—the "Quasi-War," as it was called—that *Hail Columbia* was written.

The congress of the colonies that was held prior to 1774 was known as the Colonial Congress. The Continental Congress (see page 25) was destined to shape war legislation.

Hearing the bells and cannon on the day of his death, Adams asked the cause of the celebration, and when told that it was Independence Day, he exclaimed, "Independence forever!"

In appearance he was much like the pictures of "John Bull"—short, stout, florid.

Related Subjects. The reader will add to his information regarding John Adams and his times by reference in these volumes to the following articles:

Alien and Sedition Laws
Boston Massacre
Directory
Intolerable Acts
Kentucky and Virginia Resolutions

Nullification
Political Parties
Stamp Act
Talleyrand
Washington, George
X. Y. Z. Correspondence

OUTLINE ON LIFE OF JOHN ADAMS

Outline

I. Preparatory Years

- (1) Birth and family
- (2) Education
- (3) Marriage

II. Early Public Life

- (1) In fight against Stamp Act
- (2) Defends British soldiers
- (3) Delegate to First Continental Congress
 - (a) Suggests choice of Washington as commander in chief
 - (b) Second resolutions declaring colonies free and independent
- (4) As diplomat
 - (a) In France
 - (b) In Holland
 - (c) In Great Britain
- (5) As Vice-President
 - (a) Frequently saved Washington's plans by casting vote

III. His Administration

- (1) Troubled conditions
 - (a) Split in Federalist party
 - (b) Opposition of Republicans
- (2) Difficulties with France
 - (a) X. Y. Z. Correspondence
 - (b) State of war
 - (c) Second mission
 - (d) Peace

- (3) Alien and Sedition Laws
 - (a) Naturalization
 - (b) Alien acts
 - (c) Sedition act

- (4) Kentucky and Virginia Resolutions

- (a) Alien and Sedition acts violate Constitution
- (b) Constitution merely an agreement between states as partners
- (c) Decision as to whether a law is in accord with Constitution rests with each state

- (5) Midnight Judiciary

- (6) Election of 1800

- (a) Formation of parties
- (b) Candidates
- (c) Election by House of Representatives

- (d) Downfall of Federalists

- (7) Other events

- (a) Eleventh Amendment to the Constitution

- (b) Death of Washington

- (c) John Marshall appointed Chief Justice

- (d) Capital removed to Washington

- (e) Department of the Navy created

- (f) *Hail Columbia* written

IV. Character

- (1) As a man

- (2) As political leader

Questions

What epitaph did Adams say would please him?

What was the X. Y. Z. Correspondence?

What was the cause of the "Quasi-War" with France?

Did any actual hostilities occur as a result of this tension?

Why were the Alien and Sedition Laws passed?

What was their most conspicuous effect?

What great jurist was appointed to the Supreme Court by Adams?

Why did Adams fail of reelection?

How did he show his disappointment at this failure?

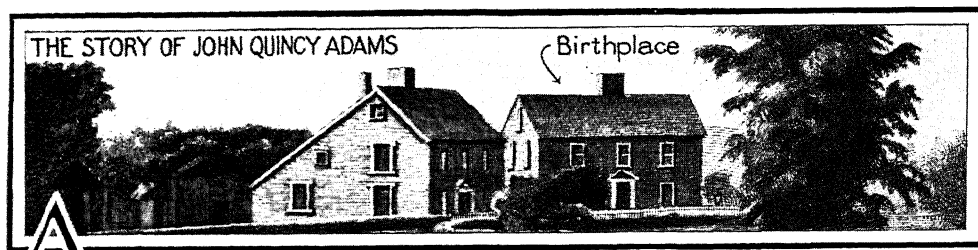
What patriotic song was published in the time of the difficulties with France?

What was Adams' opinion of his own services to the country as compared with those of Washington?

How do critics regard the work which Adams did in securing the treaty with England in 1783?

How did Adams prove during his term as Vice-President that he was superior to petty jealousies?

In what year was the Constitution revised so that the President and Vice-President should be of the same political party?



ADAMS, JOHN QUINCY (1767-1848), sixth President of the United States and eldest son of John Adams, the second President. Both father and son were distinguished diplomats, and both represented their country in Holland, in Russia, and in Great Britain. John Adams was minister to Great Britain in the trying days at the close of the Revolutionary War; John Quincy Adams held the same post after the War of 1812. It is remarkable that Charles Francis Adams, the latter's son, served his country in London during and after the War of Secession. Both John Adams and his son returned from years of diplomacy to high positions at home, the one to become Vice-President, the other to become Secretary of State. Each then served a single term as President; but here the parallel ends, for the father retired to private life, whereas the son entered a new field of political activity.

Nothing in his life is more characteristic of John Quincy Adams than his services for the last seventeen years of his life in the House of Representatives. He had held the Presidency, the highest office in the gift of the people, but instead of retiring to a premature old age—he was only fifty-two at the end of his term—he sought election to Congress. In the House of Representatives he never allowed any consideration of personal or party welfare to swerve him from the course he thought right. He opposed Jackson's aggressive policy toward the Bank of the United States, but supported his stand against nullification. For several years his chief work was the presentation to Congress of petitions for the abolition of slavery, and after the House adopted "Gag Rules" in 1836 to keep such petitions out, he fought for ten years until the restricting measures were repealed.

The years from 1836 to his death were perhaps the most interesting period of his life. As a parliamentarian and as a debater he was more than a match for any other member of the House, and he earned the title of "Old Man Eloquent." Nothing pleased him more than a verbal encounter with every slaveholder in the House. On the other hand, the English language seemed powerless to express the hatred of his opponents for him. He was even threatened with assassination, yet his ability and his courage evoked the respect of his enemies.

His Youth. John Quincy Adams was born on July 11, 1767, in Quincy, Mass. Until his eleventh year he lived there, but in 1778 accompanied his father to France. He attended school in Paris, Amsterdam, and Leyden, and at the age of sixteen went to Saint Petersburg (now Leningrad) as secretary of the Ameri-

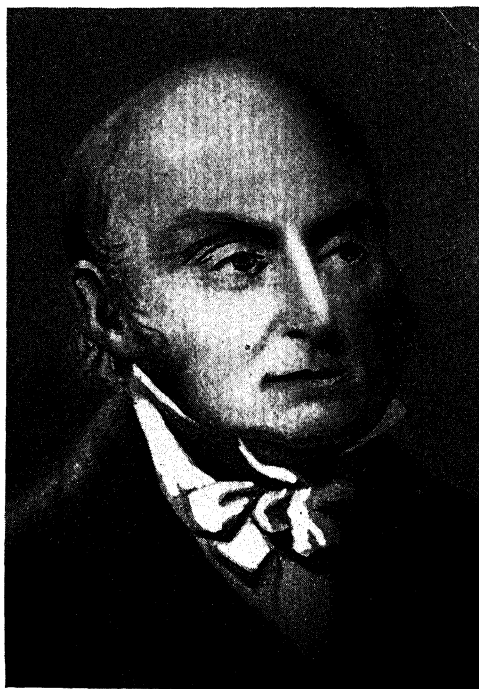


Photo: U & U

JOHN QUINCY ADAMS

Sixth President of the United States and son of the second President.

can legation. After a year in Russia, where the American representatives tried in vain to secure official recognition, young Adams traveled alone for several months through Sweden, Denmark, and Northern Germany before rejoining his father in Paris. There he was at once set to work as secretary, and had some part in drafting the treaty of peace between the United States and Great Britain.

In 1785, when John Adams was appointed minister to Great Britain, his son returned to the United States, because he felt that an

American education was the best equipment for an American career. He entered Harvard College, was graduated in 1788, then studied law, and in 1791 was admitted to the bar. The law, however, bored him so that he took his relaxation in writing a series of articles on questions of the day. He criticized some of the doctrines of Thomas Paine, the agnostic, defended Washington's policy of neutrality, and discussed the Citizen Genet incident. So able were these papers that they were at first attributed to his father.

Diplomat and Legislator. When Adams was only twenty-seven years old, President Washington, in 1794, sent him to Holland as United States minister, and two years later transferred him to Portugal. He was about to start for Lisbon when he received word that his father, who had meanwhile become President, had promoted him to be United States minister at Berlin. George Washington advised the appointment in the strongest terms, and predicted that "the young man would prove to be the ablest diplomat in the American service." He took up his new duties in the autumn of 1797, and remained in Berlin until 1801, when his father recalled him. Soon after his return he was elected to the Massachusetts Senate, but in 1803 he exchanged this place for a seat in the United States Senate.

In the Senate he was a free lance. He was nominally a Federalist, but he frequently voted with the Republicans, who later formed the Democratic party. The Hamiltonian Federalists, who were strong in the Senate, first hated him because he was the son of his father, and later they insulted him on his own account (see ADAMS, JOHN). Threats and insults were never of much avail against Adams; he went his own way. He defended the Louisiana Purchase, and was an ardent supporter of the Embargo and Non-Importation Acts of 1807, although New England stood strongly against them. The abuse heaped on him by his own constituents has scarcely been equaled in the history of the United States. To add insult to injury, the legislature elected his successor several months before the usual time. Adams accepted the insult as it was intended, and immediately resigned. From 1806 to 1809 he was professor of rhetoric at Harvard College, and in the intervals of his public duties found time to deliver lectures.

For the moment Adams was in private life, but he was too great a figure to be brushed aside by petty politics. One of Madison's first acts as President was to nominate him minister to Russia, where he remained until 1814. Adams next acted as one of the commissioners to make peace between Great Britain and the United States, at the close of the War of 1812. After the Treaty of Ghent was signed, Adams,

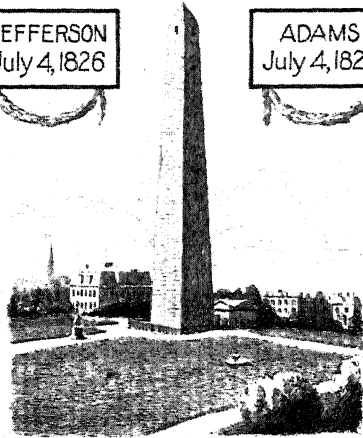
ADMINISTRATION OF JOHN QUNCY ADAMS

1825

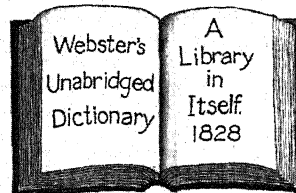
1829

JEFFERSON
July 4, 1826

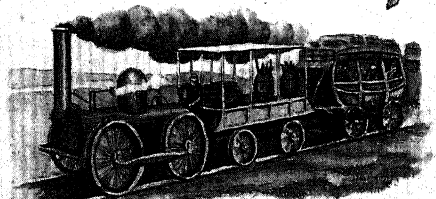
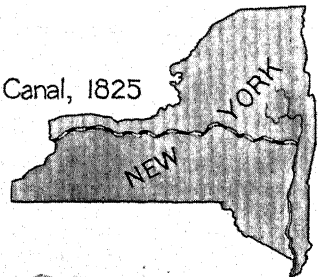
ADAMS
July 4, 1826



Bunker Hill Monument
Corner Stone Laid, 1825



Erie Canal, 1825



First Railroad Chartered, 1829

with Henry Clay and Albert Gallatin, went to London to negotiate a new commercial treaty, but before the treaty was prepared he received the news of his appointment as minister to Great Britain. After two years, 1815-1817, in London he was recalled by President Monroe to become Secretary of State.

Secretary of State. In his new post Adams conducted the negotiations which resulted in the fisheries convention of 1818 with Great Britain. By this convention the United States renounced the right to fish in British waters in North America, a right established by John Adams in 1783. Adams earnestly supported Jackson in his vigorous methods in Florida, and also conducted the negotiations which led to the cession of Florida to the United States in 1819. By far his most important work, however, was in opposing the plans of the Holy Alliance (which see), and most of the credit for formulating and announcing the Monroe Doctrine belongs to him.

As Secretary of State, Adams was regarded by many as Monroe's logical successor to the Presidency. Adams, however, made no effort to secure his own election. He was not indifferent to the honor, but it was not in his nature to attempt to secure it. The other candidates for the Presidency were Andrew Jackson, Henry Clay, William H. Crawford, and John C. Calhoun. Calhoun withdrew before the election, and with almost no opposition was elected Vice-President. The electoral vote for President stood 99 for Jackson, 84 for Adams, 41 for Crawford, and 37 for Clay. As no candidate had a majority, the House of Representatives, under the Constitution, was required to choose from the three who had received the highest number. This eliminated Clay, whose great influence in the House was thrown to Adams. Adams was elected.

The Administration of John Quincy Adams (1825-1829). Adams chose Clay as his Secretary of State. This action was not unnatural, for Clay had always taken an active part in every discussion of foreign affairs. Clay and Jackson, however, were not on good terms, and the friends of Jackson intimated that there had been a corrupt bargain by which Adams gave Clay this office in return for his influence in the election. Though this charge has long since been disproved, it pursued Clay to the end of his days. The resulting quarrel between Adams and Jackson had far-reaching results. At first the followers of the two rivals called themselves "Adams men" or "Jackson men," but as time went on, the division into new political parties became clear. The Jackson men became Democrats; the Adams men were first National Republicans, then Whigs.

In many respects the four years during which Adams was President were the least interesting of his life. Practically the entire term was

taken up with partisan quarrels, and the plans of the administration were always bitterly opposed, regardless of their merit. The Jackson men were strong enough to kill most of the important legislation proposed. One law, however, must be noticed, the Tariff of Abominations. This was passed in response to the demand from the North, especially New England, for protection for the manufacturing industries which had arisen during the War of 1812. The South, predominantly an agricultural region, wanted free trade, and attacked the law as intended to benefit New England and the Middle States at the expense of the South. The doctrine of nullification, as stated in the Kentucky and Virginia Resolutions of 1798, was again asserted, and a few years later nearly caused bloodshed (1833).

During the administration of Adams the United States was involved in negotiations with Mexico and Great Britain over boundaries. Neither of these questions was definitely settled, but the Oregon dispute was temporarily laid aside by "joint occupation." The United States also had a dispute in 1826 with the state of Georgia, which successfully defied the national authority.

Panama Congress. An important international conference was the Panama Congress, held at Panama in 1826 for the purpose of discussing the slave trade and other questions of interest to the countries of North and South America. Adams, probably prompted by Clay, accepted an invitation to send delegates, but his announcement that "ministers will be commissioned to attend" caused one of the most violent debates ever held in Congress. The opposition was especially aroused by fear of entangling alliances, and by the proposals to end the slave trade and to recognize Haiti, a negro republic. Congress finally agreed to send two ministers, but one died on the way, and the other reached Panama too late to participate.

Other Events. In his inaugural address and his first message to Congress, Adams recommended many "internal improvements," including public roads and canals, a national university and national observatories. Congress did appropriate about \$14,000,000 for such work, but this was much less than Adams wanted. One of the most notable improvements built by state aid was the Erie Canal, completed in 1825. The first railway in the United States was opened in 1826, to haul stone from Quincy, Mass., Adams' old home, to Charlestown, for the construction of the Bunker Hill Monument. The cornerstone of the monument was laid on June 17, 1825, exactly fifty years after the battle. Another striking coincidence, occurring on July 4, 1826, exactly fifty years after the signing of the Declaration of Independence, was the death

OUTLINE ON LIFE OF JOHN QUINCY ADAMS

Outline

I. Early Years

- (1) Ancestry and birth
- (2) Travels
- (3) Education

II. Early Political Career

- (1) As diplomat
 - (a) In Holland
 - (b) In Portugal
 - (c) In Berlin
 - (d) In Russia
- (2) In the Senate
- (3) As Secretary of State under Monroe
 - (a) Fisheries convention
 - (b) Florida purchase
 - (c) Monroe Doctrine
 - (d) Elected to Presidency by House of Representatives

III. His Administration

- (1) Governmental affairs
 - (a) Clay and the "corrupt bargain"
 - (b) Tariff of Abominations
 - (c) Oregon dispute

- (d) Defiance of national authority by Georgia
- (e) Panama Congress
- (2) Internal improvements
 - (a) Erie Canal
 - (b) First railroad
- (3) Other events
 - (a) Deaths of John Adams and Jefferson
 - (b) Webster's Dictionary published
 - (c) Bunker Hill Monument erected
- (4) Election of 1828
 - (a) Issues and parties
 - (b) Candidates
 - (c) What the result meant

IV. Later Life

- (1) In the House of Representatives
 - (a) "Old Man Eloquent"
 - (b) Fight against extension of slavery

V. Character

- (1) As a man
 - (a) Reasons for unpopularity
- (2) As political leader

Questions

1. How was John Quincy Adams elected? Why was this necessary?
2. What two famous men died during Adams' administration?
3. Who laid the cornerstone of Bunker Hill Monument? Who delivered the speech of dedication?
4. What was Adams' first public service?
5. How did Adams prove his sincere desire to serve his country and not merely to attain political ambitions?
6. Why was Adams not popular in his own day?
7. In how many countries did Adams serve his government as diplomat?
8. How was Adams' appointment of Clay as Secretary of State misconstrued?
9. What lasting result did the quarrel between Adams and Jackson have?
10. Sum up your impressions of the character of Adams.
11. Name one very important internal improvement that was made during this administration.
12. What new method of transportation was introduced?
13. What was meant by the "joint occupation" of Oregon?
14. Why was not Adams reelected?
15. What two popular nicknames did Adams win in the latter part of his life?
16. What speech of Adams showed that he understood clearly just how the slave question would finally become a matter to be dealt with by Federal authority?
17. How far apart were the houses in which John Adams and John Quincy Adams were born?
18. What act symbolized the union of waters of the Atlantic Ocean and the Great Lakes?
19. In what way did the son of John Quincy Adams become a national figure?

of John Adams, his father, and Thomas Jefferson. The two men died within a few hours of each other.

Election of 1828. Adams had never been popular with the people at large, and he had, moreover, made no attempt to build up a political machine. There was also a feeling that Jackson should have been chosen in 1824, and he was still the popular hero. Opposition in the South and in New England to the plans for internal improvements, disapproval of the high tariff of 1828, and the demand of the West for a hearing, all combined to make Adams' reelection impossible. Jackson was the people's choice.

The "Old Man Eloquent." At the close of his term, Adams returned to his home in Quincy, Mass. Two years later he entered the House of Representatives, with the aid of the votes cast by the Anti-Masons, and for seventeen years he served without a break. He was once asked if he did not think that membership in the House was degrading to a man who had once been President, but he proudly replied that no person could be degraded by serving the people as a Representative in Congress, or even, he added, as a selectman of his town. For these seventeen years he was the leader in Congress in the fight against the extension of slavery, although he was not himself an abolitionist.

It is noteworthy that he seems to have been the first to proclaim the doctrine on which Lincoln based the emancipation of negro slaves, for as early as 1836 he said in a speech in Congress: "From the instant that your slaveholding states become the theater of war—civil, servile, or foreign—from that instant the war powers of the Constitution extend to the institution of slavery in every way in which it can be interfered with." After 1845, when he secured the repeal of the "Gag Rules" which prevented the presentation of petitions about slavery, Adams spoke less often. Late in 1846 he had a stroke of paralysis, which confined him to his home for several months. On February 21, 1848, when at his desk on the floor of the House, he suffered a second stroke. He died two days later. A.B.H.

Louisa Johnson Adams (1775-1852). Like her predecessor, Mrs. Monroe, Louisa Adams was particularly fitted by intelligence and long residence abroad to enjoy and to ornament the official life of Washington. But, also like Mrs. Monroe, ill health prevented her from entering actively into Washington society.

She had been Louisa Catherine Johnson, daughter of Joseph Johnson, a Maryland colonist who was American fiscal agent in London. She married John Quincy Adams in 1797 in London. Four happy years at the imperial court of Berlin followed, and then eight years in Boston and Washington while Mr. Adams was Senator. Lonely years at the court of the czar in Saint Petersburg (now

Leningrad) were ended for her by a terrifying carriage journey across Europe.

When she entered the White House, her health was so feeble that she appeared only upon occasions of public receptions, where the custom of passing the cakes and wine to the guests was inaugurated. She survived her husband four years, and died at her home in Massachusetts.

Her children were George Washington Adams, John Quincy Adams, Jr., Charles Francis Adams (minister to England during the War of Secession), and Louisa C. Adams. John Quincy, Jr., married his cousin, Miss Johnson, in 1826, at the White House.

Additional Points of Interest. A favorite name for Adams in his own days was "The Walking Vocabulary."

When the Erie Canal was opened the news was "telegraphed" to New York by cannon fire. The cannons were placed at intervals of thirteen miles between Buffalo and New York. As the last cannon was fired, a keg of water from Lake Erie was poured into the Atlantic to symbolize the union of the ocean and the Great Lakes.

John Quincy Adams left what has been called by far the most valuable diary in existence. It is in twelve large volumes, and contains his comments on events from 1795 to 1848. It gives of himself "a portrait more full, correct, vivid, and picturesque than has ever been bequeathed to posterity by any other personage of the past ages."

The first edition of Webster's Dictionary appeared during Adams' administration.

Months before the Monroe Doctrine was ever announced or even formulated, Adams told the Russian minister "that the American continents are no longer subjects for any new European colonial establishments." This was the first hint regarding the famous doctrine.

Affectionate with his family, Adams had toward most people a cold, repellent manner, and it is not strange that "no man of pure life and just purposes ever had fewer friends or more enemies."

Short, stout, and bald, with a high, shrill voice, liable at any time to break, Adams owed none of his power as an orator to personal attractiveness.

Adams' last words were, "This is the last of earth! I am content."

Related Subjects. The reader will add to his information regarding John Quincy Adams and his times by reference in these volumes to the following articles:

Anti-Masons	Monroe Doctrine
Bank of the United States	Nullification
Genet, Edmond	Oregon (History)
Georgia (History)	Political Parties
Jackson, Andrew	Tariff

ADAMS, LOUISA JOHNSON, wife of President John Quincy Adams (which see).

ADAMS, MASS. See MASSACHUSETTS (back of map).



Photo: U & U

LOUISA JOHNSON ADAMS

ADAMS, MAUDE KISKADDEN (1872—), an American actress whose greatest success was won in the plays of J. M. Barrie—as Lady Babbie in *The Little Minister*, as Peter Pan in the play of the same name, and as Maggie in *What Every Woman Knows*. She was born in Salt Lake City, Utah, appeared on the stage while a child, and at sixteen years of age joined E. H. Southern's company. Her family name was Kiskadden, but she chose her mother's maiden name, Adams, for the stage. As a member of the Charles Frohman stock company, her reputation grew steadily, and she gained great popularity in the plays mentioned, as Juliet (with William Faversham as Romeo), and as the Duc de Reichstadt in *L'Aiglon*. Later she appeared in the title rôle of Rostand's *Chantecler*, and in Barrie's *Legend of Leonora*; after 1914, the season in which she appeared in the latter play, Miss Adams retired from the stage.



Photo: Brown Bros.

MAUDE ADAMS

ADAMS, MOUNT. See **CASCADE RANGE**; **WHITE MOUNTAINS**.

ADAMS, SAMUEL (1722–1803), an American statesman of the famous Adams family, second cousin of John Adams, and one of the signers of the Declaration of Independence. He early devoted himself to politics, and in the dispute between America and the mother country he showed himself one of the most efficient and unselfish advocates of American freedom. Several influential political papers for the cause of independence were written by him. Adams sat in Congress eight years, but during that period showed no outstanding aptitude for legislative duties. From 1789 to 1794 he was lieutenant governor of Massachusetts, from 1794 to 1797 was governor, and then retired from public life.

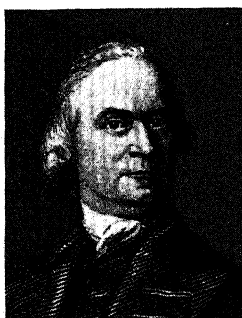


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SAMUEL ADAMS

ADAMS, WILLIAM TAYLOR. See **OLIVER OPTIC**.

ADAMS ACT. See **AGRICULTURAL EXPERIMENT STATIONS**.

ADAM'S ALE. See **ALE**.

ADAM'S APPLE, the projecting cartilage of the larynx, noticeable under the skin on

the throat of all people, in some appearing very prominently. It received its name from an old belief that a piece of the apple given to Adam by Eve (*Gen. III, 6*) stuck in his throat. See **LARYNX**; **CARTILAGE**. K.A.E.

ADAM'S NEEDLE. See **YUCCA**.

ADAMSON LAW, a statute passed by the United States Congress in 1916 for the purpose of preventing a complete tie-up of the country's railway system. Early in the year the demands of the unions (or brotherhoods) were formulated—an eight-hour day in freight-train service, without a reduction in pay, all work over eight hours to be paid for at the regular rate, plus fifty per cent. The railroads rejected the demands, and all attempts at mediation failed; thereupon the union officials called a strike on all the railroads of the country, to take effect in five days. The situation was exceedingly serious, particularly in view of the strained international relationships that had developed because of the World War. Accordingly, President Wilson asked Congress to avert the threatened tie-up by the enactment of legislation establishing the eight-hour day as the basis of pay. Congress promptly passed the desired legislation. How promptly Congress acted is shown by the fact that only five days elapsed between the date the President proposed the measure to Congress and the day he signed the act (August 29–September 3). The railroads disputed the constitutionality of the statute, but its constitutionality was affirmed by the Supreme Court in March, 1917.

Provisions of the Act. After January 1, 1917, eight hours "shall be deemed a day's work and the measure or standard of a day's work for the purpose of reckoning the compensation for services" of all railroad employees engaged in any capacity in the operation of trains in interstate commerce, subject to certain exceptions. The act, therefore, does not limit the working day of railroad employees engaged in train movement to eight hours; rather, it provides that their wages shall be based on an eight-hour day, with *pro rata* pay for over-time. E.J.

ADAPTATION. See **ENVIRONMENT**.

ADDAMS, JANE (1860—), an American social settlement worker, long esteemed as "the first woman of Illinois," and in later years one of the most influential women in the world in the realm of social reform.

Born at Cedarville, Ill., she studied at Rockford (Ill.) Seminary, in Europe, and at the Women's Medical College in Philadelphia; then, convinced by her study of social conditions that she should devote her life to work among the poor, she went to Chicago and there founded Hull House (which see), a social settlement in the city's slums. In all her early work she had the assistance of Ellen Gates Starr.

Energetic and capable, sympathetic but not sentimental, and gifted with the ability to

grasp at once the problems of the poor, Miss Addams soon won a place for herself and her institution in the life of the neighborhood, and it was not long before Hull House was recognized as the leading social settlement of the United States. Miss Addams, too, came to be looked upon as an authority on many social matters. On such questions as the evils and the possibilities of tenements, the problem of child labor, and the like, she thought deeply and wrote and spoke well. Nor did she confine



JANE ADDAMS

Of world-wide fame as an authority on social problems.

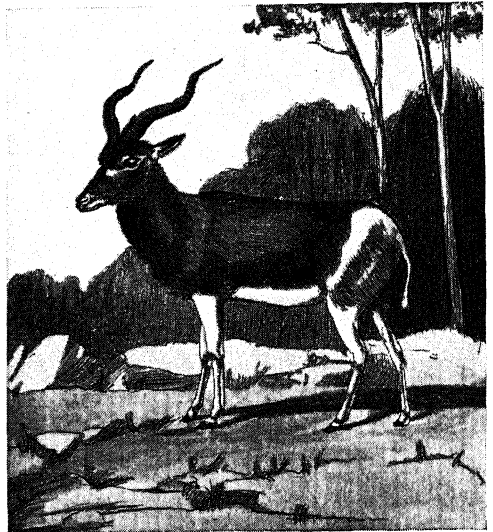
herself to her work at Hull House. For three years she did most efficient service as a city inspector of streets and alleys, and in 1909 acted as president of the National Conference of Charities and Correction. She became active in the movement for woman's suffrage, and in politics took a prominent part in the formation of the Progressive party in 1912.

In April, 1915, when there was convened at The Hague an International Women's Peace Congress, with delegates from fourteen countries, she was made its chairman, and was further entrusted with the duty of visiting the warring nations and presenting to their governments the women's peace petition. On that errand she was received by the leading statesmen of the Continent and by the Pope. It was expected that she would be an influential member of the Ford peace party, but a serious illness compelled her to remain at home (see FORD, HENRY). Later, she was a delegate to and presiding officer of several women's peace congresses in Europe.

Her Books. The most popular and widely read of Miss Addams' books is *Twenty Years at Hull House*, a fascinating account of her great work; but no less authoritative in their way are her other publications, *The Spirit of Youth and the City Streets*, *Democracy and Social Ethics*, *A New Conscience and an Ancient Evil*, and *The Long Road of Women's Memory*.

ADDAX, *ad' ax*, or **ADDAS**, a species of antelope of Northeastern Africa and Arabia, about three feet in height at the shoulders, and reddish-white in color. It has large, rounded hoofs, which enable it to run with great speed across the desert sands. The horns are about four feet long, beautifully twisted into wide sweeping spirals, with the points directed outward. It has tufts of reddish-brown hair

on the forehead and throat, and a white blaze, or stripe, on the nose. The addax is hunted by Arabs with horses and greyhounds, both for its flesh, which is used for food, and



THE ADDAX

for its skin, which is valuable commercially, and because these desert dwellers like to test the speed of their animals. See ANTELOPE. W.N.H.

Scientific Name. The addax belongs to the family *Bovidae*. Its scientific name is *Addax nasomaculatus*.

ADDED MONEY. See MONEY (Unusual Terms Applied to Money).

ADDER, a name applied to several different snakes, both poisonous and harmless. The European *viper*, the only venomous snake in Great Britain, is commonly called an adder. The *puff adder* of Africa is a deadly snake, four to five feet long, which has the habit of hissing with a puffing sound when roused to anger. Another venomous species is the *death adder* of Australasia. The copperhead of the United States is also known as *red adder*, and the water moccasin as *water adder*. Both of these are poisonous. Two harmless species, the milk snake and hognose snake, are sometimes called, respectively, *milk adder* and *blowing adder*. L.H.

Scientific Names. The European adder, or viper, is *Vipera berus*. The puff adder is *Bilis arietans*. The death adder is *Acanthophis antarctica*. The hognose snake is *Heterodon platyrhinus*. The scientific names of the copperhead, milk snake, and moccasin are given in the articles on those species.

Related Subjects. The reader is referred to the following articles in these volumes:

Copperhead
Milk Snake

Moccasin Snake
Snake

Viper

ADDER'S TONGUE. See DOG-TOOTH VIOLET.

ADDING MACHINE, a name generally, but not always accurately, applied to calculating machines (which see).

ADDIS ABABA, *ah' dis ah bay' bah*, the capital of Ethiopia, long known as Abyssinia. See ETHIOPIA.

ADDISON, JOSEPH (1672-1719), an English essayist and poet, one of the outstanding figures in the development of English prose.

He brought to perfection that form of essay which pictures contemporary life and manners, and his vehicle of expression has continued to be an example of a graceful, flowing style. Samuel Johnson, Addison's contemporary, said: "Whoever wishes to attain an English style, familiar but not coarse, and elegant but not ostentatious, must give his days



Photo: Brown Bros.

JOSEPH ADDISON

and nights to the volumes of Addison." Addison was born in Milston, Wiltshire. In his youth he attended Charterhouse School, where he became friendly with Richard Steele, who was later his associate in essay writing (see STEELE, RICHARD). At Oxford, Addison distinguished himself as a writer of Latin verse, and after his graduation so added to his reputation that he obtained from the government a pension, which enabled him to travel.

A poem celebrating Marlborough's victory at Blenheim, entitled *The Campaign* (1704), brought him the reward of a political office, and for the next few years he gave more of his time to various governmental duties than to literary work. In 1709, however, he began to contribute to Steele's periodical, *The Tatler*, and in his association with his friend for the next few years he produced the best work of his life. In 1716 he married the dowager Countess of Warwick, and the following year was appointed Secretary of State.

Addison as a Writer. The essays contributed by Addison to the *Tatler*, *Spectator*, and *Guardian*, in association with Steele, especially the *Roger de Coverley* series in the *Spectator*, have charmed readers from the author's day to this. Added to a refined and graceful style is a clear and decisive characterization, enlivened by a wit that is never coarse and a satire that never wounds. Addison's poetry was very popular in his time, and his drama entitled *The Tragedy of Cato* was translated into several languages. To-day his verse is little read, with the exception of a few sacred pieces. The magnificent hymn entitled *The Spacious Firmament on High* is from his pen.

ADDITION. Addition follows close upon counting, is related to it; indeed, it is a short method of counting. Arithmetic begins with counting and measuring.

The lowest tribes perform the operation of counting, and children will be delighted with stories from naturalists tending to show that animals count (see ARITHMETIC). They will be more interested to know that observers among the tribes of South America, Australia, and various islands report many tribes who have names for numbers only to two or three or five, their highest number being the word for *plenty*, or *many*, or *heap*. This seems to indicate that they become mentally confused when the number of objects exceeds 2 or 3 or 4. The Tasmanians count "pamery, prica, cardia," or "1, 2, more than 2," or "1, 2, plenty." The New Hollanders have no name for numbers beyond 2. The Watchandie count "1, 2, many, very many," and if pressed hard will add the counts "2+1, 2+2," thus reaching 4. In Queensland a traveler finds the tribes counting "ganar, burla, burla-ganar, burla-burla, korumbo," that is, "1, 2, 2+1, 2+2, much," or "great." Another tribe improves upon this by having a 3, and so count "1, 2, 3, 3+1, 3+2, 3+3," reaching 6. In this simple count is seen the beginning of addition. The child counts first after the manner of the savage. He says, "1, 2, 3, 6"; "1, 2, 3, 4, 10"; or "1, 2, 3, a lot," showing that his mind grasps the 1, 2, 3, or 1, 2, 3, 4, and then is indefinite. Later he makes the combinations, seeing 2+1, 3+2, 3+3, and so on.

When the child first counts objects, he may think of "1" as the name of the first object, "2," the name of the second, and so on. Being asked for two, he gives the *one* object which he called "2" in counting. Asked to show 3, or 4, he points to the *one* object which he called "three" or "four" in counting. This state of mind in early counting is very common. It often escapes the attention of the teacher or the parent who is teaching the child; it escapes her because of the simplicity of the counting process to the adult. The error often persists through the early months of school life and confuses the child in his first steps in counting, and, indeed, in his early number thought in general. The teacher at school must meet this difficulty and overcome it, and the mother in her play-counting at home with the child can do much to clear the little one's path of such misconception.

Exercises such as the following are exceedingly helpful at this stage:

(1) The child is counting pennies; the teacher or mother says, "Give me one penny; give me another penny. Now I have two pennies; give me another one. Now I have two pennies and one penny; that is three pennies," and so on. The teacher and child may alter-



COUNTING PENNIES

nate in counting, or two children may count in this way while the teacher and other children observe.

(2) Place a group of pennies on the table to be counted; count them with the child, beginning at the left, then at the right, in the middle, and so on, so that a different penny gets a new count name each time.

(3) Then count in this way: take one penny in hand on count "one"; take two pennies in hand on count "two"; three pennies in hand on count "three," and so on, exhibiting the group on each count, thus emphasizing the *group*, and not the last one counted. This counting may be varied by using nickels, dimes, inch-cubes, and the like, and by making the groups to be counted irregular in shape, by counting in order and counting by skipping

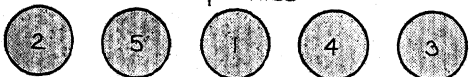
a - Five pennies



b - Five pennies



c - Five pennies



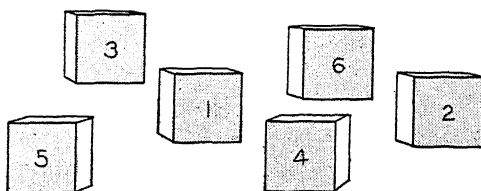
VARIATIONS IN COUNTING

about; that is, by having count "two" fall on an object not adjacent to count "one."

Suggestions for further help to the child in counting and adding:

(1) The teacher or mother can create opportunity for measuring with definite measures, as a foot, an inch, a yard, an hour, a day, a

minute, a penny, a dollar, a dime, a pound, a quart, and others. Much of the early number work should grow out of concrete conditions and be dealt with through definite units of measure, both at home and at school.



(2) The child may measure the table, the floor, the height of members of the family, his blocks, his playhouse, the length of his and his friends' jumps or throws, the top of his desk and of his teacher's desk, the blackboard, the cardboard he uses in construction work, his school garden, his own space in it, etc., using the yard, foot, or inch, as his distances are long or short.

(3) He counts, as he measures, the number of yards, or feet, or inches, in the lines measured.

(4) He may add to find the perimeter of table (distance around), room, rug, cardboard, desk, garden, etc. For example, he finds a rug 2 yds. long and 1 yd. wide, and adds: 2 yds. + 2 yds. + 1 yd. + 1 yd. = 6 yds., or measuring it in feet, he adds: 6 ft. + 6 ft. + 3 ft. + 3 ft. = 18 ft. The floor gives larger numbers; the length may be 18 ft. and the width 15 ft.; his problem then is 18 ft. + 15 ft. + 18 ft. + 15 ft. = 66 ft., or 6 yds. + 6 yds. + 5 yds. + 5 yds. = 22 yds.

(5) For this the child should have a foot



MEASURING THE GARDEN

rule and a yard rule, both marked off clearly in inches, and the yard marked clearly in feet. In this repeated measuring and counting with definite units of measure, the child comes to see that a sum is made up of two or more quantities which have the same measuring unit. This is said commonly in the familiar phrase, "Only *like* things can be added."

(6) With these and a good measuring tape, the measuring may extend into the yard, the farm, the playground, the school ground, the city block, and so on, to any region of interest to the child.

Such work gives excellent opportunity for the child to master the simple *number* in the life about him. At this stage, the home offers opportunities for work and material which will extensively supplement the work of the school. The data secured give the child his own material for counting and adding. It keeps him busy helping himself. Thus the home may furnish much raw material for the work in addition. Getting data at home for class work in school should be a large part of the "home work" in arithmetic.

Some explicit suggestions for the work in addition:

(a) Grocery order for the day, week, month; find sum.

(b) Bills for dry goods at each buying, for week, for month.

(c) Sum of school purchases for all the children of family for day, week, and so on.

(d) Money earned by father and other members of family in a day, week, a month.

(e) Expense of keeping pets.

(f) Cost of milk and cream for week, or period for which bill runs.

(g) Cost of a meal.

(h) Length of block from width of lots.

(i) Finding number of plants in a bed by adding the numbers in the various rows.

(j) Find value of products sold by father in city office or on farm, father giving sales data.

(k) Adding distances traveled each hour or day in automobile.

(l) Keep account of sales by mother, of chickens, eggs, butter, vegetables, turkeys, and so on, mother giving data.

(m) Counting shade trees, fruit trees, number of elms, oaks, poplars, apples, cherries, peaches, and seeing that the groups added make the whole number counted. The data for these problems are found in the home, and used either in school or at home.

(n) Add 5 to each of the following: 1, 4, 6, 7, 9, 8, 4, 3, 7, 2, 5, 9, 6, 8, 5. Add 8 to each. Add 7 to each. Begin at left, at right, at any point. Place in a column thus:

$$\begin{array}{r} 1 \\ 4 \\ 8+6 \\ 7 \\ 8 \end{array}$$

Add both ways $8+4$, $4+8$. There is much variation possible in this kind of exercise for review, slow and rapid. Give answer without saying

$8+1=9$. The eye sees 1, 8 as 9; 4, 8 as 12. Counts by 2's, 3's, etc., starting at 0, 1, 3, 20, or elsewhere.

(o) See how far the child can get in ten seconds, thirty seconds, one minute, and so on. Set a series



THE GROCERY BILL

of such problems, as, "Begin with 3, and add 4's, stop between 40 and 50. Begin at 1 and add 9's, stop between 70 and 80."

Further Suggestions. The exercises can be varied by use of the following examples, and others like them:

$$\begin{array}{r} 1 \\ 4 \\ 6 \\ 9 \\ 7+8 \\ 2 \\ 8 \\ 9 \end{array} \quad \begin{array}{l} \text{(a) Give answers only.} \\ \text{(b) Say 7 and 5 are 12.} \\ \text{(c) Write } 7+5=12. \\ \text{(d) Say 7 plus 5 equals 12.} \end{array} \quad \begin{array}{r} 5 \\ 3 \\ 6 \\ 7 \\ 3 \\ 2 \\ 6 \\ 5 \end{array}$$

Place sum below

$$\begin{array}{r} 6 \\ +7 \\ \hline \end{array} \quad \begin{array}{r} 7 \\ 7 \\ \hline \end{array} \quad \begin{array}{r} 3 \\ 7 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ 7 \\ \hline \end{array} \quad \begin{array}{r} 4 \\ 7 \\ \hline \end{array} \quad \begin{array}{r} 2 \\ 7 \\ \hline \end{array}$$

Place sum below

$$\begin{array}{r} 9 \\ +8 \\ \hline \end{array} \quad \begin{array}{r} 3 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 5 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 6 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 9 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 3 \\ 8 \\ \hline \end{array} \quad \begin{array}{r} 5 \\ 8 \\ \hline \end{array}$$

$$\begin{array}{l} 7+n=9 \\ n+7=9 \\ 6+n=9 \\ 8+n=9 \\ n+6=9 \\ n+8=9 \end{array}$$

(a) Say 7 and 2 are 9.
(b) Write $7+2=9$.
(c) Say 7 plus 2 equals 9.
Vary the way of saying it.

$$\begin{array}{l} 9=n+8 \\ 9=7+n \\ 9=4+n \\ 8=6+n \\ 8=5+n \end{array} \quad \begin{array}{l} n+n=16 \\ n+7=16 \\ n+9=16 \\ 9+n=18 \\ 9+n=17 \end{array}$$

$$\begin{array}{r} 6 \\ n \\ 15 \end{array}$$

$$\begin{array}{r} n \\ 8 \\ 17 \end{array}$$

The child must erase n , and put the correct digit in its place.

$$\begin{array}{r} 3 \\ +5 \\ \hline 8 \end{array} \quad \begin{array}{r} 13 \\ +5 \\ \hline 18 \end{array} \quad \begin{array}{r} 23 \\ +5 \\ \hline 28 \end{array} \quad \begin{array}{r} 33 \\ +5 \\ \hline 38 \end{array} \quad \begin{array}{r} 43 \\ +5 \\ \hline 48 \end{array} \quad \begin{array}{r} 53 \\ +5 \\ \hline 58 \end{array}$$

$$\begin{array}{r} 7 \\ +8 \\ \hline 15 \end{array} \quad \begin{array}{r} 17 \\ +8 \\ \hline 25 \end{array} \quad \begin{array}{r} 27 \\ +8 \\ \hline 35 \end{array} \quad \begin{array}{r} 37 \\ +8 \\ \hline 45 \end{array} \quad \begin{array}{r} 47 \\ +8 \\ \hline 55 \end{array}$$

$$\begin{array}{r} 47 = 40 + 7 \\ +69 = 60 + 9 \\ \hline 116 = 100 + 16 \end{array} \quad \begin{array}{r} 158 = 100 + 50 + 8 \\ +223 = 200 + 20 + 3 \\ \hline 381 = 300 + 70 + 11 \end{array}$$

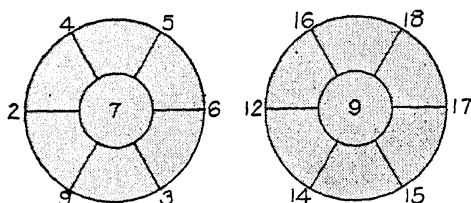
6	5	4	9	8	2
9	3	1	6	5	7
2	4	7	8	6	4
6	1	4	2	9	3
9	2	8	1	8	5
7	3	5	6	7	6

Teacher points to a number, and the child gives the sum of it and all numbers above it in the column; for example, point to 2 in the column and the child gives the sum 15. The numbers may be simple at first, and be made more and more difficult and the square larger. Teacher may vary her question; for example, ask the sum of the number pointed to and the one above it; also the two above it.

Fill each space so that the horizontal row will give the sum 20. Add horizontally and vertically, and see if sums for entire square agree.

In the first circle, give sum of center number and each number on circumference; for variation, write the sum on

6	9		4
8		3	5
	6	4	7
4	3	5	



line. In the second circle, give the number which added to center number makes the number on circumference; write it on line.

Add horizontally and vertically:

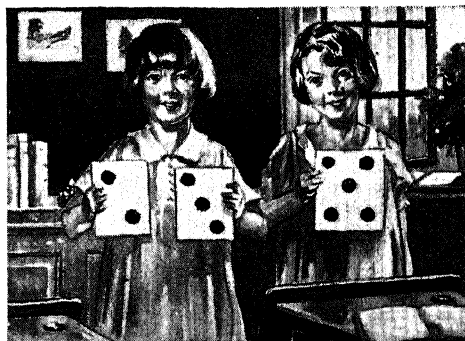
$$\begin{array}{r} 746 + 9237 + 4826 = \underline{\hspace{2cm}} \\ 923 + 4679 + 7869 = \underline{\hspace{2cm}} \\ + \quad + \quad = \underline{\hspace{2cm}} \end{array}$$

This is good practice and may be checked.

Games That Make for Interest and Quick Response. 1. Dominoes painted on paper or cardboard. Children "match" ends. Find all that are alike. Find groups that make 7, 10, 8, and so on.

2. Children throw ball or bean bag, trying to hit inside circle; 10 points are given for each successful throw at small circle, and 6 for striking inside of large circle. Children take sides, keep tally, and see which side wins.

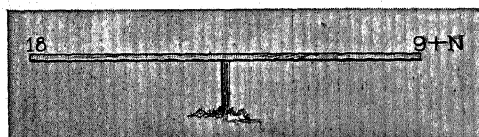
3. Class may take sides for *number card* game. Teacher holds up card such as those illustrated—each for an instant. The child who answers correctly gets the card. The side that has the greater number of cards wins.



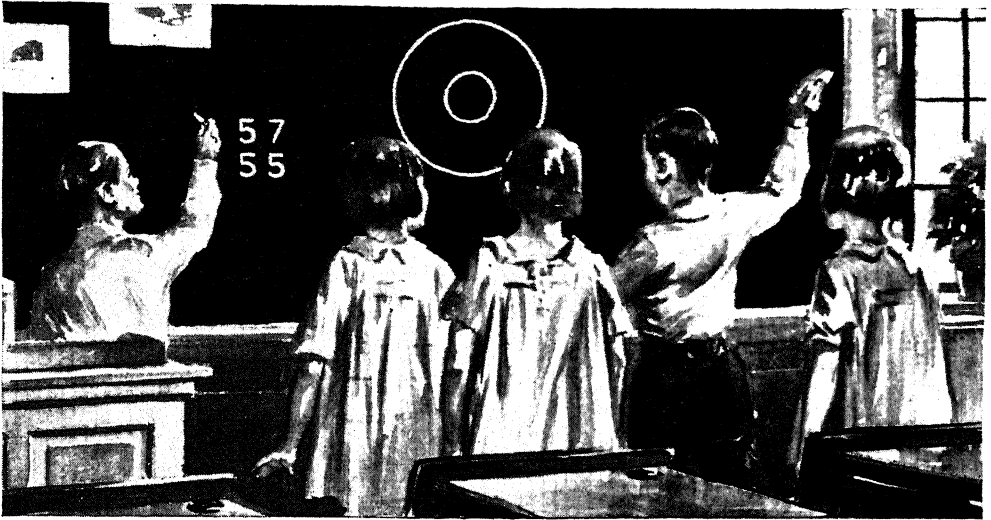
VISUALIZING ADDITION

This game may be played without taking sides.

4. To keep the see-saw balanced what must n be? The teacher draws the see-saw



on the board; changes one or both numbers when child has substituted correct digit for n .

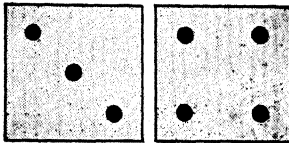


BEAN BAG GAME

Sources of Problems in addition found in current literature, connecting arithmetic with geography, history, study of social conditions, civics, and "current events":

1. Products of the country given in quantity and value: wheat, corn, oats, potatoes, hay, meat, butter, eggs, flour, cotton, coal, lumber, iron, steel, and so on. These appear in various ways; for example, they may be given yearly over a period of twenty years. Child adds to find for a period of 5 years, or 10 years, or 15 years, and so on.

$$3 + 4 = 7$$



2. Exports are given in same way.
3. Acreage devoted to various products in different states. From this the child finds area in certain sections, or in the whole country, given over to wheat, cotton, etc.



NUMBER CARDS

4. Areas of states given. Child finds area of a given section; for example, the Middle West.

5. Population may be added in the same way.
6. The same material is given concerning foreign countries.
7. Imports to the country.
8. Immigration covering a period of years.
9. Health statistics.
10. Tax statistics.

Suggestions for self-help. The child may set down problems for himself, and he may vary his columns. Let him write, "long, narrow" columns, "short, wide" columns, "long, wide" columns. Let him use tests suggested further on in this article. He may time himself, seeing how many problems he can do in a minute, in three minutes, in five minutes. If there are two or more persons working together, zest is added as to accuracy and time.

Processes of Addition. The above are suggestions as to conditions that give rise to problems in addition, and develop keen interest for numerical value. What immediately follows will deal with the *process* of addition.

Although the subject of addition may seem simple to an adult, there are numerous steps in learning it which must be mastered by the child. These steps should be presented in the order of their difficulty, *one at a time*. It is important, too, as each step is presented, that an opportunity be given to practice it before other points are given. It is not possible in this article to give all of the drill materials which would be desirable, but the successive processes are indicated, with the type of exercises needed in the development of each.

When the child has acquired the idea of number by counting and adding objects, as indicated above, he should next learn to count and add abstract numbers. This may best be done by means of a game in which the score is kept in figures, such as bean bag, or the

number card game, which may be played in the schoolroom, if desired. For bean bag, have two circles drawn on the blackboard, as in the illustration. The children throw a ball or bean bag, trying to hit inside the circle; ten points are given for each successful "hit" in the small circle, and six for striking inside of the large circle. The children may take sides, keep score, and see which side wins. The credit may vary, as seven for the small, and five for the large circle. For the number card game, the class may take sides, and either the teacher or a pupil chosen for that purpose should hold up cards such as those illustrated—each for an instant. The child who answers correctly gets the card. The side having the greater number of cards wins. The numbers to be placed on these cards are the addition combinations given below.

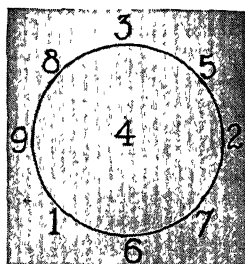
Children are usually interested in knowing that there are just 100 ways in which the numbers to 10, including zero, can be added to each other. Here is a table of these combinations. They should be used for constant drill, but not in the regular order here given:

ADDITION COMBINATION

1.	0	0	0	0	0	0	0	0	0
2.	0	1	2	3	4	5	6	7	8
3.	0	1	2	3	4	5	6	7	8
4.	0	1	2	3	4	5	6	7	8
5.	0	1	2	3	4	5	6	7	8
6.	0	1	2	3	4	5	6	7	8
7.	0	1	2	3	4	5	6	7	8
8.	0	1	2	3	4	5	6	7	8
9.	0	1	2	3	4	5	6	7	8
10.	0	1	2	3	4	5	6	7	8

Various devices may be used for drill on these additions. For example, a circle like the illustration may be placed on the board, and the number in the center added to each number on the circle. Then the number in the center may be changed and the process repeated.

Now follows a series of steps arranged in the order of their difficulty. The types of exercises given should be literally supplemented, and ample



practice given in each. The headings show the nature of the process exemplified:

1. Column addition, with sums below 9+9:

2	3	7	5	4	6
1	2	8	9	3	2
4	6	1	0	6	7

2. Number of two figures added to one figure:

13	12	10	11	14	12
1	3	4	5	3	6

3. Adding two-figure numbers:

12	14	10	13	32	53
16	31	45	24	07	25

4. Adding tens:

10	30	40	40	50	70
20	10	20	40	30	10

5. The simplest form of carrying:

15	18	29	38	19	28
5	3	1	2	2	3

6. Adding longer columns of figures:

3	5	6	7	9	8
2	3	4	2	3	4
1	6	7	5	6	3
4	2	3	4	1	5

7. Addition of two-figure numbers, with carrying:

18	27	25	34	19	46
36	45	56	49	55	26

Also, this type of the same:

26	12	36	57	29	9
4	8	18	3	12	46
13	22	5	24	5	11

8. Adding three-figure numbers:

118	142	276	344	285	464
454	571	314	186	687	277

9. Zeros in addition:

200	409	306	570	675	274
321	142	206	180	108	726

10. Adding dollars and cents:

\$1.25	\$1.35	\$3.04	\$2.97	\$1.93	\$.95
.75	4.05	5.87	4.25	6.01	3.98
			.14	.28	1.59

These progressive steps should be taken gradually, and enough drill given to insure mastery of each before the next is attempted. The child is then prepared to proceed to the addition of longer columns and to considerably larger numbers.

Checking Addition. In order to check the correctness of any addition, it is usually sufficient to add the numbers in reverse order from the original addition.

With the older children the method of adding the columns in any order and putting down the partial sums and then getting the total is an excellent help to good understanding of number and a good method of testing one's own work in addition. To illustrate:

addition usually appears in the Banker's Method, thus:

32
17 and the sum is read as the last sum set
19 down and the units digit in each of the
10 other sums.

10972

Work with numbers is usually interesting to children. Their success in performing the various operations is a source of satisfaction and an encouragement to further effort. The work should be related to the child's experience and should never be separated from the number relations that he may meet in life outside the school.

E.U.G.

Outline on Addition

1. Definition
 - Short method of counting
2. Early steps
3. Errors to be guarded against
 - (a) Thinking of numbers as names
4. Measuring with definite measures
5. Concrete conditions necessary
6. Use of home material
7. Addition taught by means of games
8. Processes
 - (a) Counting objects
 - (b) Adding objects
 - (c) Counting abstractly
 - (d) Adding abstract numbers
 - (e) The addition combinations
 - (f) Column addition
 - (g) Numbers of two figures added to one figure
 - (h) Adding two-figure numbers
 - (i) Adding tens
 - (j) Carrying
 - (k) Adding three-figure numbers
 - (l) Zeros in addition
 - (m) Adding dollars and cents
9. Checks
 - (a) Adding in reverse order
 - (b) Partial sums
 - (c) Casting out nines

ADDRESS', FORMS OF. The forms used in addressing persons who hold titles of nobility or offices of dignity are more rigidly observed in monarchies than in countries under a republican form of government. The Constitution of the United States forbids the government to grant titles of nobility, or officials of the government to accept them from foreign states, but custom has sanctioned certain forms of address for the President, Vice-President, and other officers of dignified position. The following list includes the more important forms:

Ambassador: His Excellency, the [French] Ambassador. A United States ambassador to a foreign country is addressed as "Honorable."

Archbishop: His Grace, the Lord Archbishop of ——. Letters begin "My Lord Archbishop."

Cabinet Officer: The Honorable the Secretary of ——; The Honorable the Postmaster-General, etc.

Countess: The Right Honorable the Countess of ——. Letters begin "Madam," addressed as "Your Ladyship."

Duke: His Grace the Duke of ——; addressed personally as "Your Grace."

Earl: The Right Honorable the Earl of ——, if a member of the Privy Council; addressed personally as "Your Lordship."

Governor: In Massachusetts by law and in other states by courtesy, this official is addressed as "His Excellency the Governor of ——"; "The Governor of ——"; or "Honorable ——, Governor of." He is formally spoken to as "Your Excellency."

King: The King's Most Excellent Majesty. Letters begin "Sire"; addressed as "Your Majesty."

Pope: Letters are addressed "His Holiness, the Pope," or "Our Most Holy Father, Pope ——" Letters begin "Most Holy Father."

President: Letters are addressed: "The President, White House"; or "The President of the United States, White House"; or "His Excellency the President of the United States." Letters begin "Mr. President."

Prince: "His Royal Highness, Prince of ——"; or "His Royal Highness, the Duke of ——" Letters begin "Sir"; he is referred to personally as "Your Royal Highness."

Queen: The Queen's Most Excellent Majesty. Letters begin "Madam"; addressed as "Your Majesty."

Supreme Court, Chief Justice: Letters are addressed "The Chief Justice of the United States"; or "The Honorable ——, Chief Justice of the Supreme Court of the United States." Letters begin "Mr. Chief Justice," or "May it please your Honor."

Supreme Court, Associate Justice: Letters are addressed "Honorable ——, Associate Justice of the Supreme Court." This jurist is always referred to as "Mr. Justice ——."

Vice-President: Letters are addressed "The Vice-President"; or "The Honorable the Vice-President of the United States"; or "The Honorable ——, Vice-President of the United States." Letters begin "Mr. Vice-President" or "Sir."

ADE, ayd, GEORGE (1866-), an American humorist and playwright, first became known as the author of a series of *Fables in Slang*, in which he combined racy wit with a keen insight into human nature. Ade was born in Kentland, Ind., and was educated at Purdue University. He began his literary work as a writer for newspapers in Lafayette, Ind., and in Chicago, where his clever sketches in the *Record*, entitled *Stories of the Streets and the Town*, won him a favorable reputation

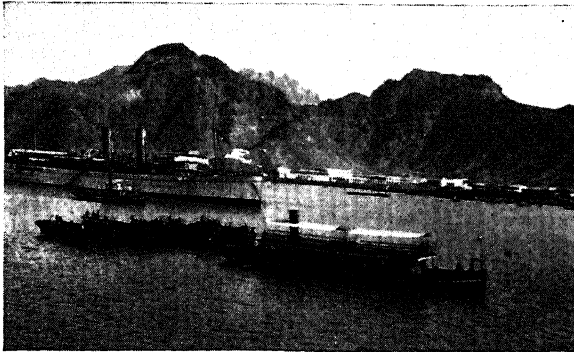


Photo: Brown Bros.
GEORGE ADE

as a humorous observer of life. Ade purchased a country estate at Brook, Ind., about fifty miles from Chicago, and he has made his

home there for many years. In that rural environment much of his most successful work was accomplished.

His Productions. His comic operas, *The Sultan of Sulu* and *Peggy from Paris*, and his comedies, *The County Chairman*, *The College Widow*, *The Slim Princess*, and *The Fair Co-ed*, in some of which Elsie Janis starred, were popular early successes.



and were followed by *Just Out of College*, *The Sho-Gun*, *The Bad Samaritan*, and *Father and the Boys*; in the latter William H. Crane starred. Ade also wrote moving-picture scenarios for Thomas Meighan.

ADELAIDE, *ad' e layd*, capital of South Australia (which see).

ADELPHI COLLEGE. See NEW YORK (Education).

ADEN, *ah' den*, or *a'-den*, a city in Aden, in Southwestern Arabia, a British possession often called the Gibraltar of the East. It lies on the shore of the Gulf of Aden, near the southern end of the Red Sea. Possession of Aden, together with the control of the Suez Canal, gives Great Britain command of the maritime route from Europe to India and the Far East.

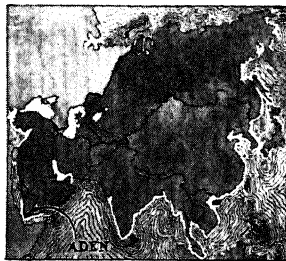
Aden's position is of strategic importance, not only in a military sense, but also in a commercial sense. Its harbor is large and deep and it is the most important of the coaling stations on the Suez route. It has an extensive commerce, chiefly in coffee, hides, and tobacco brought from the interior. The local control of the town and a protectorate of seventy-five square miles surrounding it is in the hands of a political resident, who is also the commander of the British garrison. Population of the city, 55,000. Aden is said to have the hottest year-round climate of any place on earth.

The Gulf of Aden, on whose shore the city is located, is that part of the Indian Ocean extending

westward to the strait of Bab-el-Mandeb, at the south end of the Red Sea. It is about 550 miles long, and has a maximum breadth of 250 miles.

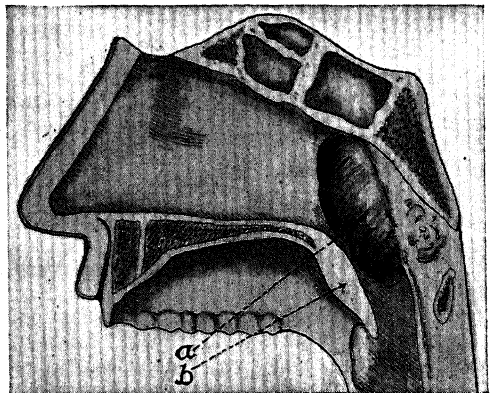
ADENOIDS, *ad' e noydz*, an excessive growth of glandular tissue in the space between the back of the nose and the throat. This growth obstructs the passage through which the air reaches the lungs, and breathing through the nose becomes difficult or impossible. But breathing through the nose is very important, for only in this way is the air warmed and partially rid of dust and germs before it reaches the lungs. On the other hand, the obstruction of the air passages prevents the proper expansion of the lungs and the development of the chest. Children suffering from adenoids usually have a characteristic facial expression, with open mouth and a staring, half-stupid look. They "catch cold" very easily, are hard of hearing, and very often suffer from discharging ears, owing to the fact that infection travels from the region of the adenoids to the middle ear through the Eustachian tube (which see). Such children sleep with the mouth open; they snore and are restless in their sleep. Mentally they are backward, unable to concentrate their attention for any length of time, and generally slow and dull. In addition, such children usually have enlarged tonsils (see TONSIL). See, also, EDUCATION (Hygiene of Education).

Treatment. This consists in the cutting out of the adenoids. This operation when performed by a skilful surgeon is practically without danger. In the great majority of cases the removal of ade-



ADEN

This section, at the southern extremity of the Arabian desert, is almost rainless, hence all necessities of life must be imported. The photographic reproduction shows the city with mountains in the background.



ADENOIDS

The position of adenoid growth is shown at *a*. The part marked *b* is the soft palate. The figure shows how the former crowds upon the latter.

noids brings about in the child a very pronounced physical and mental improvement. K.A.E.

ADHESION, *ad he' zhun*, the attraction which causes matter of one kind to stick to matter of another kind when the two kinds are brought into close contact. The contact must be very close, for it is the molecules themselves that exert the attractive force. The force is called *adhesion* when the attraction is between unlike molecules; it is called *cohesion* when the attraction is between molecules of the same kind. It is cohesion that holds the molecules together in a stick of chalk; it is adhesion that causes the chalk to stick to the blackboard. It is cohesion that holds the particles of taffy together; it is adhesion when the taffy sticks to one's fingers.

Adhesion is one of the commonest properties of matter, and illustrations of it can be seen on every hand. It is adhesion that causes paint to stick to wood, a postage stamp to an envelope, mud to an automobile tire, dirt to our hands. The force of adhesion varies greatly for different substances. Those substances in which it is very strong are used to stick bodies together, and are called adhesives. Glue, mucilage, and paste are common examples.

When one tries to pour medicine out of a bottle almost full, the adhesion of the liquid to the glass causes the liquid to tend to run down the outside of the bottle. Since the adhesion between most liquids and grease is much less than between the liquids and glass, greasing the neck of the bottle makes it easier to pour out the liquid without wetting the bottle with it. See **COHESION**; **CAPILLARITY**. A.L.F.

Related Subjects. The following adhesive substances are described in these volumes under their own titles.

Cement	Mucilage
Glue	Plaster of Paris

ADIRONDACK MOUNTAINS, a group of mountains occupying a considerable section of Northeastern New York, constituting one of the most attractive sections east of the Mississippi River. They lie within what was once called Adirondack Province, a great stretch of wild and rocky country, covering about 12,500 square miles north of the Mohawk River. The highest peaks are for the most part in Essex County. By some authorities the Adirondacks are considered to be a part of the Appalachian highlands, but others regard them as an independent mountain system. The highest peak, Mount Marcy, rises to an altitude of 5,344 feet; Mount McIntyre is but 232 feet lower; and Haystack, Dix, Whiteface, Giant, and Skylight mountains are all more than 4,500 feet high. Famous among the lakes of the range are Champlain and George.

The rugged beauty of the Adirondacks, with their numerous mountain lakes and great forest areas, attracts large numbers of tourists and sportsmen.

One of the most notable spots is the Adirondack State Park, a beautiful section including about half of the range. This was made a park, partly to preserve the natural beauty of the mountains, and partly to conserve the rain waters and the moisture of melting snows, for when the hillsides are denuded of their forest coverings, the waters run down to the streams and cause destructive floods. The state of New York has also set aside a portion of the Adirondacks as a forest farm, in connection with which is maintained the School of Forestry of Cornell University. See **NEW YORK (Physical Features)**.

ADJECTIVE. The word *adjective* is derived from two Latin words, meaning *added to*. An adjective is any word or group of words which, added to a noun or pronoun, makes its meaning clearer and more definite. It is said to *modify*, or *limit*, the noun or pronoun, since it makes its application more specific, less general. Thus, *country* has a world-wide interpretation, but by prefixing the adjective *cold* we limit its meaning to countries outside tropical and sub-tropical latitudes.

The study of adjectives is an important part of the study of language, for inaccurate use of adjectives and the use of an unnecessary number of them mark a careless and slovenly speaker or writer.

If the adjective answers the question *What kind?* with reference to a person or object, it is a *descriptive*, or *qualifying*, adjective. If it merely points out without describing, it is a *limiting*, or *definitive*, adjective.

Descriptive Adjectives. It is the descriptive adjectives that are most numerous and that give color and variety to language. There are three classes, illustrated in the following sentence: "This bright, well-mannered lad is a typical American product." *Bright* and *typical* are *common adjectives*, modifying respectively the nouns *lad* and *product*; *well-mannered* is a *participial adjective* modifying *lad*; *American* is a *proper adjective* modifying *product*. In English all proper adjectives, like proper nouns, must be capitalized, although this is not the custom in many foreign languages.

Predicate Adjectives. When a qualifying adjective is used to complete the meaning of the verb *to be*, or such similar verbs as *seem*, *appear*, *become*, *look*, *feel*, *taste*, or *smell*, it is called a *predicate adjective*; as, The poppy is *crimson*; he felt *sad*; the nut tasted *bitter*.

Adjectives as Nouns. A descriptive adjective may be used as the subject of a sentence by prefixing *the*, thus indicating a class; as, The *wise* are polite all the world over; the

busiest can always find time for the odd tasks that the *indolent* refuse.

Adjectives as Objective Complements. When an adjective is placed after the direct object of a verb to modify the object and to complete the meaning of the verb, it is called an *objective complement*, as, The gift made the child *happy*.

Limiting Adjectives. The two kinds of limiting adjectives are illustrated in the sentence, "The five officers made weekly reports to George the Third, confirming him in an absurd notion that too much liberty had already been granted." *Five*, *weekly*, *third*, and *much* are all limiting adjectives denoting respectively number, frequency, numerical order, and quantity. They are grouped under the general term of *adjectives of quantity*. *The* and *an* or *a* are limiting adjectives belonging to a special group called *articles*, the being the definite article and *a* and *an* the indefinite. See ARTICLE.

Pronominal Adjectives. Some grammarians class the pronouns *this*, *that*, *these*, *those*, *which*, *each*, *such*, *both*, *most*, *many*, *few*, and the like, as *pronominal adjectives*, but it is generally considered simpler to treat them as *adjective pronouns*. See PRONOUN.

Position and Order of Adjectives. When it modifies a noun, the adjective, unless used to complete the predicate verb, generally precedes the noun and is preceded by the article; as, an *agreeable* man. After *how*, *so*, and *too*, however, the adjective follows the article; as, *How agreeable a man*; *so agreeable a man*; *too agreeable a man*.

Where there is a series of adjectives, the one that is most closely connected with the object is placed next to the noun, while the others are arranged according to importance. Thus we say, The *little old* lady, not the *old little* lady; an *expensive new gold* watch, not a *new gold expensive* watch. If they are of equal rank, they are arranged according to harmonious sound, usually the shortest first.

There are some constructions in which, for purposes of emphasis, clearness, euphony, or rhythm, the adjective follows the noun; as, splendor *unsurpassed*; a pupil *ambitious* to excel; the child *asleep*; the victim *afraid*; everything *good*; nothing *useless*; Alexander *the Great*; notary *public*, and the like.

Used to modify a pronoun, the adjective follows; as, We came upon them, *wearied and anxious*.

Comparison of Adjectives. In most languages the adjective changes in form to agree with the gender, person, number and sometimes case of the noun or pronoun to which it belongs. In English it has an invariability of form, the only inflection being for the purpose of indicating variation in amount or degree. This is called *comparison*.

Comparison by Endings. Words of one syllable, and some of two which do not sound awkward in the inflected form, add the suffix *er* to the *positive* to form the *comparative*, and *est* to form the *superlative*:

POSITIVE	COMPARATIVE	SUPERLATIVE
neat	neater	neatest
dry	drier	driest
feeble	feebler	feeblest
lovely	lovelier	loveliest

Comparison by Adverbs. Most adjectives of more than one syllable, and all adjectives of participial form, are compared by prefixing *more* or *less* to the positive to indicate the comparative degree, and *most* and *least* to indicate the superlative:

POSITIVE	COMPARATIVE	SUPERLATIVE
active	more active	most active
enthusiastic	more enthusiastic	most enthusiastic
delighted	more delighted	most delighted
tired	less tired	least tired
willing	less willing	least willing

Irregular Comparison. About twenty common adjectives are irregularly compared; as, *good (well)*, *better*, *best*; *many (much)*, *more*, *most*; *far*, *farther (further)*, *farthest*; *fore*, *former*, *foremost (first)*, and others. For complete list and full discussion see COMPARISON, where there will also be found a list of the adjectives that are absolute in meaning, not admitting of comparison.

Parsing the Adjective. To parse an adjective these three points must be stated:

1. Its *classification*—whether descriptive or limiting, and if the latter, whether an adjective of quantity or an article.
2. Its *degree of comparison*—whether positive, comparative, or superlative.
3. Its *syntax*, or use in the sentence, which involves connecting it with the noun or pronoun whose meaning it modifies.

Common Errors. Among the most frequent errors in the use of adjectives are the employment of the adjective for the adverb, the adverb for the adjective, and the placing of the adjective with the word denoting the quantity instead of the noun described. These and many other everyday mistakes are covered in the following examples, and in the list given in the article ADVERB.

Robert sings good, for *Robert sings well*. The reference is to the action of singing, and a verb always demands an adverbial modifier.

Robert looks badly, for *Robert looks bad*. *Looks* in this construction is an inactive verb expressing Robert's condition without reference to any action. This calls for an adjective instead of an adverb.

Robert looked close at the specimen, for *Robert looked closely at the specimen*. Here the action of looking is implied, which necessitates the use of the adverb.

Lavender smells sweetly, for *Lavender smells sweet*. What is meant is that lavender is *sweet*.

It does not do any smelling; there is no action; therefore the adverb is incorrect. *Sweet* is used as a predicate adjective.

He was real sick, for *He was very sick*. *Real*, being an adjective, cannot modify another adjective. Besides, *real* does not indicate degree.

A strong cup of coffee, for *A cup of strong coffee*. The adjective should be placed next to the word it modifies. It is the coffee that is strong, not the cup.

You have grown considerable, for *You have grown considerably*. The adjective *considerable* cannot be used to modify the verb *have grown*; the adverb must be used.

I am afraid I can't locate the passage, for *I fear I can't locate the passage*. It is correct to say *I am afraid*, meaning *I am frightened*; but it is not correct to use the adjective with a following objective phrase. This construction demands a transitive verb.

Apples are healthy, for *Apples are healthful*. There is such a thing as a healthy apple, meaning an apple that is sound and good to the core, but the idea here intended is that a diet of apples will impart health, a meaning that is conveyed by the adjective *healthful*.

Of two evils choose the least, for *Of two evils choose the less*. This old proverb is generally incorrectly quoted. Where only two things are compared, the superlative form of the adjective is illogical, and one should be careful to use the comparative form.

Most all the members were present, for *Almost all the members were present*. *Most*, being an adjective, cannot be employed as an adverb. Whenever *nearly* can be substituted, *almost* is the correct word to use.

I have received your last picture, for *I have received your latest picture*. It is not the last picture, unless the subject is dying or has registered a solemn vow never again to sit for a photograph.

He is a new beginner, for *He is a beginner*. The adjective *new* is superfluous because the idea is bound up in the very meaning of *beginner*.

He is bound to go abroad, for *He is determined to go abroad*. The first form is only correct in the event that he is really bound by oath or contract to make the trip.

There were no less than thirty present, for *There were no fewer than thirty present*. *Less* is used for quantity, *fewer* for number, and where individuals rather than masses are implied, the latter is the proper adjective.

She is a nice girl, for *She is a charming or pleasant girl*. *Nice* conveys the idea of precision, as, *nice distinctions*, *nice choice of language*, and the like.

It is a universal, world-wide custom, for *It is a universal custom*, or *It is a world-wide custom*. Since the two adjectives convey the same meaning, one is redundant. This tendency to use superfluous adjectives is illustrated in such common phrases as *rich millionaire*, *two twins*, *habitual habit*, *verdant green*, and others of the same brand of wordiness.

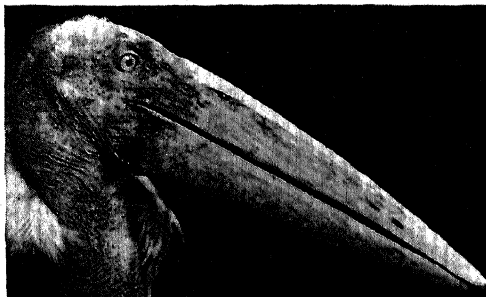
Awful, *horrible*, *frightful*, *mad*, *grand*, *gorgeous*, *elegant*, *splendid*, and others, carelessly used in everyday speech for less significant words. Care should

be taken to avoid extravagant and inaccurate adjectives, since aptness is an essential of forceful language. E.U.G.

Outline on the Adjective

1. Definition
 - (a) Used with noun or pronoun
 - (b) Limits or modifies meaning
2. Importance of adjectives
3. Classes of adjectives
 - (a) Descriptive
 - (b) Limiting
4. Positions and order
 - (a) Modifying a noun
 - (b) Modifying a pronoun
5. Comparison of adjectives
 - (a) By endings
 - (b) By adverbs
 - (c) Irregular comparison
 - (d) Adjectives not admitting of comparison
6. Common errors

ADJUTANT, a species of stork whose name is derived from its dignified poses, which are supposed to resemble the strutting and pompous airs of a self-important young army officer. The adjutant bird is not found in Europe or America, but is common in India, the East Indies, and other parts of Southeastern Asia. It



Photos: World Wide; U & U

THE ADJUTANT

The solemn-looking bird at the left is in the London Zoölogical Gardens. Below is a more detailed view of the head and bill.

stands about five feet high, and its outspread wings measure about five feet from tip to tip. The body is white, but the neck is flesh-colored, marked with black, and the wings and back are a slate-gray. A long air pouch hangs from the front of the neck. The adjutant is an efficient scavenger, a characteristic which has led the government of India to protect it from plumage hunters. Its feathers are called marabou in commerce, and resemble those of the true marabou (which see). D.L.

Scientific Name. The adjutant belongs to the family *Ciconiidae*. It is classed as *Leptopilus argala*.

ADJUTANT, a military officer, usually with rank of captain, appointed to assist the commanding officer in the discipline and training of his troops, and in the general administration of regimental affairs. In the United States army, regimental adjutants are appointed for four years. See **ARMY**.

ADMETUS, *ad me' tus*, in mythology, the husband of Alcestis (which see).

ADMINISTRATOR, a person under bond chosen by a probate court to take charge of the property of a person who has died without leaving a will (who dies intestate), or who has not named anyone as his executor. The closest blood relatives are given preference in the appointment of administrators, and creditors have the next right to consideration. In all his acts, the administrator is responsible to the court for faithful performance of his duties. When a foreigner dies without leaving a will, the consul from his country sometimes acts as administrator. See **WILL**.

AD'MIRAL, the office of highest rank in the naval establishment of a country, except in England, where the admiral of the fleet has higher dignity. In the navies of all countries there are three grades in this office: admiral, vice admiral, and rear admiral. In the United States navy, however, the rank of rear admiral is now the highest permanent rank an officer can ordinarily attain. The rank of admiral is given temporarily to the officers in command of the Atlantic, the Pacific, and the Asiatic fleets; when they retire from the chief commands they resume their previous rank as rear admirals. The rank of vice admiral is given temporarily to the officers second in command of these fleets, and implies rank next to an admiral, but the rank usually lapses; except in times of stress, no officer holds this title.

The admirals and vice admirals are chosen by the President from among the rear admirals, who vary in number from fifteen to twenty-five. At the age of sixty-two years, all officers are released from active service and are placed on the retired list. Rear admirals are chosen from the list of captains.

Until 1915, when the present system was adopted, only two men, David Glasgow Farragut and David D. Porter, had ever held the rank of admiral in the United States navy. The special rank of *admiral of the navy*, a unique distinction, was created in 1898 for George Dewey; since that time, Benson, Gleaves, Rodman, Wilson, Coontz, Robison, and Mayo have been admirals. Until 1915 no man had held the rank of vice admiral since the death of Stephen Rowan in 1900. Coffman and Grant were appointed at that time. In 1917 William S. Sims, in American command in Europe in the World War,

was made vice admiral, with Jones, Williams, and Rogers.

The rank of admiral compares with that of a general in the army, a vice admiral with a lieutenant general, and the rear admirals rank with major generals. In addition to their salaries, these officers receive small allowances, according to their rank, to provide for expenses. The officers of the United States navy receive higher salaries than the corresponding ranks in any other nation in the world. See **RANK IN ARMY AND NAVY**.

AD'MIRALTY, in Great Britain, the department of government which is responsible for the management of the British navy. The powers of the admiralty correspond roughly to those of the Department of the Navy at Washington, for the United States, or of the Naval Service at Ottawa, for the Dominion of Canada. These powers are exercised by a board, comprising five lords commissioners of the admiralty. Two of the commissioners are civil, or political, lords, while the other three are naval, or sea, lords.

Admiralty Law. This term is applied to the special body of law relating to ships and shipping. It takes its name from the fact that all disputes relating to maritime transactions were originally settled by the lord high admiral of the navy. It relates chiefly to such matters as actions to recover possession of a ship, actions for damages to shipping, salvage cases and assaults on the high seas.

The law of admiralty is a distinct law of its own, based on the old law of the Mediterranean and the Roman law. In England it is a part of the supreme court of judicature. In Canada the functions of an admiralty court were first exercised by the Supreme Court, but are now held by the Dominion Exchequer Court and a number of local or district judges in Admiralty [for further details see **CANADA (Government)**]. In the United States, all admiralty cases are heard first in the Federal district courts, and appeal may be taken to the Circuit Court of Appeals and to the Supreme Court.

ADOBE, *a doh' be*, a word of Spanish origin, applied to unburnt, sun-dried bricks used in the arid regions of Mexico and in Southwest United States, and also to the peculiar clayey soil from which they are made. When moist, the soil is very plastic and can be molded into any shape, but when dry, adobe is almost unbreakable. This characteristic was recognized at an early date by the aborigines, who not only made bowls, pitchers, and other vessels from it, but shaped the muddy clay into bricks, which they laid out to dry in the sun. Adobe houses are common even to-day in Mexico and Arizona, where they are used by the Mexicans and Indians, because of their cheapness and ease of construction. Many white people, who could afford other building material, prefer adobe houses because they are always cool, even in the hottest weather.



Photo: U & U

ADOBE BUILDINGS

A typical scene in the Indian section of the great Southwest of the United States, where civilizing influences have not changed the rough, crude beauty of the desert Indians and their ways.

The process of making adobe bricks is simple. The wet adobe is shaped into bricks of various sizes, which are then baked by exposing them to the sun for ten days or two weeks. During this time they are turned every day. Bricks made in the same way were used by the ancient Egyptians and Babylonians, and were fashioned by the children of Israel during their enslavement in Egypt.

ADOLESCENCE, *ad o les' ens*, the state or process of growing from childhood to manhood and womanhood. The term comes from a Latin word meaning *to grow up*. In law, adolescence covers the period between the ages of fourteen and twenty-one years for boys, and between twelve and twenty-one for girls. During these years, body and mind undergo important changes, which may be classified as physical, intellectual, social, and moral. In considering these changes, one must remember that there is no distinct dividing line between childhood and adolescence—one period gradually and, so far as the child is concerned, unconsciously merges into the other.

Physical Changes. *Bones and Muscles.* In most children, early adolescence is characterized by rapid growth of the bones and muscles, and the youth seems to grow tall overnight. Because of this rapid growth, the muscles are soft and pliable, and can readily acquire any new movement. On the other hand, because of this immaturity, they become fatigued with comparatively little exercise. The nerves do not develop as rapidly as the muscles, and the youth finds it difficult, if not impossible, to gain complete command over his movements. For this reason, the period of early adolescence is often called the "awkward age." The youth is "all arms and legs," and he does not know what to do with them. This awkwardness makes the youth extremely self-conscious,

and any reference to his condition or movements is keenly felt and resented. Many men and women have incurred the lasting ill-will of boys and girls by this sort of criticism.

Internal Development. The development of the internal organs is more marked than that of the bones and muscles, and its influence extends to the intellectual and moral life. These changes are accompanied by extraordinary nervous excitement and pressure, and the system, like a pent-up volcano, is surcharged with energy that must find an outlet. Unless such an outlet is found along right channels, it may find an escape through avenues that lead to viciousness.

Mental Conditions. From twelve to fourteen in girls and from thirteen to fifteen in boys, the powers of observation develop rapidly, memory achieves its highest activity, and imagination reaches its normal stage, becoming very active in the fifteenth and sixteenth years. Judgment rapidly gains strength, and reason begins to assume its sway.

In the stress and strain incident upon the development of the reproductive organs are born passions which the youth is often scarcely able to control. The selfish or self-centering feelings usually reach their height and begin to decline in the sixteenth year. Love of excitement is strong, and the individual will put forth the utmost energy in following those lines of activity which appeal most strongly to him. This is the age of "crazes," and we find the "reading craze," the "collecting craze," and numerous others particularly prominent. These are perilous years, because passions are strong, and the moral will is weak.

Moral Conditions. The moral judgment is influenced more largely by the custom of the group, by the standards established by previous training, and by the feelings than it is by reason. This is the impulsive age, and the

youth is prone to make moral decisions, which, after more careful consideration, he may regret. Self-hood is strongly assertive, and the youth keenly resents being treated as a child. It is difficult for parents to realize that their children have grown up, but failure to accept this fact and treat the youth accordingly is the source of many a heartache to fathers and mothers in after years.

During early adolescence, the moral judgment of others is severe. From lack of experience, the youth has little sympathy, and he sees nothing lying between the breaking of a law and the punishment that should follow. He is equally severe in his judgment upon himself, and often sees an impassable gulf yawning between himself and his ideals. Fortunately, however, his courage is good and his ambition unfaltering, and he gradually overcomes the seeming obstacles that beset his pathway. A word of encouragement from his parents and teachers now and then is a great incentive to the youth of tender age.

Social Instincts. The youth has a strong desire for the companionship of those of his own age, and this desire lies at the foundation of the large number of boys' and girls' organizations.

The best of these organizations, when directed by a person who is in sympathy with their purpose, are beneficial (see AUDUBON SOCIETY; BOY SCOUTS; CAMP FIRE GIRLS). Unless organizations of this sort are provided, boys especially are liable to form "gangs" whose influence over their members may be anything but beneficial.

During early adolescence, boys' and girls' interests are different, and they work better in separate organizations, but after sixteen they usually enjoy working together along lines in which their tastes are similar. In games and sports boys prefer those that are more strongly athletic than girls enjoy. Boys like to play ball, wrestle, swim, hunt, and fish. Girls prefer indoor games and outdoor games not requiring severe exertion.

The Awakening. Youth is the time of high ideals, lofty aspirations, and boundless ambition. During this period most of the habits of life are formed, and vocations are chosen. It is a time of day-dreaming and castle-building. This period may come gradually, like the dawn; it may appear suddenly, like a burst of sunshine through a rift in the clouds; but come it will, in some degree, to all normal persons. It is the time of regeneration, when all things take on a new significance. The view of life broadens; experiences deepen; some great ideal is selected, the following of which becomes a life purpose. The dauntless youth takes a far look into the future and sets forth upon life's journey with a zeal and energy that knows no defeat. C.E.S.

Related Subjects. The reader is referred in these volumes to the following articles

Anger in Childhood	Fear in Childhood
Character Training	Habits in Childhood
Dishonesty in Childhood	Juvenile Delinquency
Fatigue and Nervousness	Mental conflict

ADONAI, *ad o na' i*. See JEHOVAH.

ADON'IJAB, brother of Solomon (which see).

ADONIS, *a doh' nis*, the name of a genus of plants, native to Europe and Asia, so called because one species, the *pheasant's eye*, has bright-scarlet petals which legend declares were stained by the blood of the beautiful youth Adonis (see ADONIS). Some of the species have been naturalized in the United States and Southern Canada, where they are cultivated as garden plants. B.M.D.

Scientific Names. The genus *Adonis* belongs to the same family as the buttercup, *Ranunculaceae*. The pheasant's eye is classed as *Adonis autumnalis*. Other species found in flower gardens are *A. aestivalis* and *A. vernalis*.

ADONIS, in Greek mythology, was a beautiful youth loved by Venus. This goddess, refusing to be consoled after his death, begged Proserpina to let him return to the earth from the lower world. The goddess of the lower regions at length consented that the boy should live eight months of each year on earth. This was one of the myths of the seasons, Adonis' months on earth representing the spring, summer, and early autumn, his months below the ground the gloomy winter. Another myth relating to the seasons is given in the article PROSERPINA. The myth of Adonis is very generally supposed to be of Phœnician origin. See MYTHOLOGY.

ADOPTION, *a dop' shun*, in law, is the legal act of taking into the family a child, upon whom all the privileges belonging to a child born in wedlock are conferred. This is the usual understanding of the term; however, in some jurisdictions adults may be adopted, to lessen complications in a matter at issue. All of the American states and Canadian provinces have statutes governing the adoption of children, as have also most countries of Europe. An adoption is not legal unless these statutes have been complied with.

ADRE'NAL GLANDS. See ADRENALIN.

ADRENALIN, *ad re' nal in*, a medical preparation employed both as an astringent and an hemostatic agent, that is, an agent adapted to contract muscular tissues and to arrest hemorrhage. Because but little has been heard of its properties by the public until within recent years, many have been led to believe it to be a new discovery in medical science. As a matter of fact, physicians have long understood its properties and have employed the drug in their practice, but it has now been adapted with remarkable success to cases of more delicate nature.

Adrenalin is an active principle of the adrenal glands, or suprarenal capsules, which are situated close to the kidneys in all vertebrate animals. No more powerful agency to affect muscular contraction or arrest the flow of blood is known. For many years it has been widely employed to stop hemorrhage, but to-day the ordinary citizen has been led to marvel that when it has been injected in the vicinity of the heart of persons supposedly dead, its strong astringent properties often have caused revival of heart action, return to consciousness, and in many cases recovery of health. In some instances, while cure has not been vouchsafed, it has prolonged life for a time. See ANESTHETIC; ASTRINGENT. W.A.E.

ADRENALS. See GLAND (Ductless Glands).

ADRIAN, a' dri an, a name borne by six Popes, the most noteworthy of whom were Adrian IV and Adrian VI.

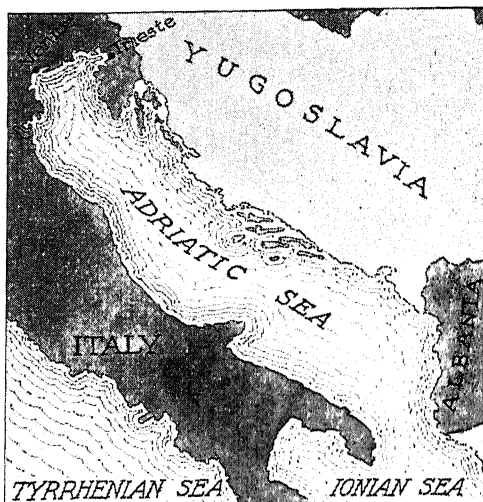
Adrian IV, born about 1100 and Pope from 1154 to 1159, was the only man of English birth ever elected to the Papal chair. His original name was NICHOLAS BRAKSPERE. In his boyhood he became a servant in a French monastery, rose there to the position of abbot, and in 1146 was made cardinal-bishop of Albano. His election to the Papacy, eight years later, was very displeasing to the Italians. While in office he placed Ireland under the rule of Henry II of England. Pope Adrian's desire to assert the supremacy of the Papal office led to a conflict with the Hohenstaufen emperors (see HOHENSTAUFEN), and he was on the point of excommunicating Emperor Frederick I when he himself died.

Adrian VI was elected to the Papal chair in 1522, at a time when the Church was being weakened by such abuses as the excessive granting of indulgences, and the Protestant Reformation in Germany was in progress. The Pope was eager to correct abuses, but he was strongly opposed to Martin Luther's course. Dying within two years of his election, Adrian VI was unable to bring about the hoped-for reforms. See REFORMATION, THE.

ADRIAN, MICH. See MICHIGAN (back of map).

ADRIANOPLE. See TURKEY (The Cities).

ADRIATIC SEA, an arm of the Mediterranean, stretching in a northwesterly direction from the Straits of Otranto, along the eastern coast of Italy. Its length is about 480 miles, its average breadth about 100 miles, and its area about 60,000 square miles, nearly twice that of Lake Superior. In the north it forms the Gulf of Venice, on which is Venice, the city on the sea. In the northeast is the Gulf of Trieste. Formerly the Adriatic was the highway of an extensive commerce of the medieval cities and those of the early modern period; to-day it is important for local shipping and as an outlet to ports of the Mediterranean Sea. The prevalence of sudden squalls in winter makes navigation difficult. The name "Bitter Sea" was applied during ancient times because of the warfare among people living along its shores. See VENICE.



LOCATION MAP

'Tis sweet to hear,
At midnight on the blue and moonlit deep,
The song and oar of Adria's gondolier,
By distance mellowed, o'er the waters sweep.
—BYRON.

ADULT EDUCATION is a new name for an old thing. The term helps, however, in bringing out in sharp relief a general view that seemed to regard schooling as identical with education. Schooling was for the days of our youth, and it was thought education was finished. The "regular" educational system was primarily concerned with the person who had time and leisure for full-time education. Even when this was the dominant thing, individuals who had finished their schooling were continuing their education. Correspondence schools, lyceums, chautauquas, reading courses, personal services of libraries, series of lectures by university professors and others, evening schools—all these existed and were used as instruments for the after-education of persons whose schooling was presumably ended.

What Is Adult Education? The term adult education, in its most general sense, includes practically all the intellectual efforts of the individual after his formal schooling is completed. In a more restricted sense, it comes more and more to include any systematic, organized, and continuous effort of education by adults or by persons whose schooling is completed. One authority has defined it not in relation to the formal educational period of the individual, but in relation to his occupation. He says, "It is a process of learning on the initiative of the individual, seriously and consecutively undertaken, as a supplement to some primary occupation." This would include not only the man in the shop who is taking his blueprint reading, but also the

assistant in the university who supplements his teaching service by graduate study.

Range of Adult Education. It is not, of course, confined to elementary instruction, or Americanization for foreigners, or reading and writing for illiterates, but includes frequently the postgraduate courses in professional schools for the practitioners in medicine, in law, and in engineering. In the most general sense, it must include everything that individuals do for their own education, particularly after the period of schooling and outside of their vocational pursuit. It would include all effort to improve one's skill or vocational efficiency, particularly in a supplementary way. In its more narrow sense, it emphasizes continuity of effort. But there is no limit of age, or class, or previous condition of mental servitude, or schooling.

How It Is Carried On. This education is carried on at the present time by a whole host of educational instrumentalities—university extension, apprentice schools, evening schools, continuation schools, coöperative courses, correspondence schools, lyceums, chautauquas, corporation schools, labor colleges, museums of art and of science, short courses and long courses given by educational institutions, by professional associations, by individual corporations, Young Men's Christian Association, Young Women's Christian Association, Knights of Columbus, and the forums of various kinds. The American Library Association has taken a commendable leadership in the field, and local libraries are adding specialists who are interested in the educational guidance of readers, instead of the custodianship of books.

Education Does Not End with Schooling. One of the great benefits of the continuation education of the individual is the modification of the concepts of formal schooling and education. It emphasizes the fact that no one ought to regard himself after his graduation as intellectually dead or sterile. It ought to be, in fact, a commencement of a "personally directed education" by one's self. The possibility of continued education ought to be a continuing stimulus to individuals. In this connection it may be said that the function of the adult-education movement, applied to everybody, no matter what his previous education, may be summarized in a phrase, "to keep intellectually alive."

Self-Education. The emphasis on adult education as a process of self-education renders a service to the ordinary full-time education. The method of adult education is essentially a method of self-education. It depends on the student's purpose, on his initiative, on his persistence, on his utilization of opportunities. In emphasizing this fundamental fact, it serves full-time education by reminding it that all education, in school and out of school,

formal and informal, full-time and part-time, is a process of self-education. And school education is effective only to the degree that it, too, is the product of the student's own purpose, his initiative, his out-of-school experience, and his utilization of the educational facilities.

Adult Education Largely Vocational. There are two principal characteristics of the present opportunities that may be noted. One is that in content they are largely vocational in character, and are designed to supplement the primary occupation of the individual. Even when the training is academic in character, it is frequently merely the effort to satisfy the preliminary educational requirements of some profession, the necessary high-school credits, or the satisfaction of pre-legal or other scholastic preliminaries.

Adult Education Largely Self-Supporting. The other characteristic is that these activities are almost self-supporting, even when undertaken by state universities and other public agencies. This, of course, is not true in public evening schools, public continuation schools, and public vacation schools.

One authority puts a significant point well when he says that to a very large degree adult education is sold rather than bought. To a considerable extent the enterprise of adult education is frankly commercial in character, and high-pressure salesmen are used to get aspiring, ambitious, or well-intentioned people to subscribe to courses. There is danger here, because people do not know the difference between the good and bad. And one of the important next steps in this movement is to develop means to sift the good from the bad, and to guide students to take things that are within their capacities.

Sporadic Character. The individualistic character of our adult education is perhaps responsible for its fundamental defect, its sporadic and unsystematized character. Good intentions regarding education are rather widely diffused, but they very soon dissipate themselves. Correspondence instruction, which in North America is largely a commercial enterprise, thrives financially on the fact that people as a general rule fail to complete their courses. This serious mortality of students is true under public as well as under private auspices. Efforts are being made, so far as correspondence instruction goes, to remedy this defect by bringing a person from the educational agency in contact with the student at periodical intervals in his home city. This is possible, because of the cost involved, only in cities which have large numbers of students registered for particular courses.

The same sporadic character exhibits itself in what are called study classes. These classes

are well begun, but gradually diminish in attendance. Public evening schools everywhere have shown the same tendency. Perhaps the lack of continuous effort on the part of students with good intentions is due somewhat to the pedagogical methods of this adult instruction, wherever given.

Possible Misunderstanding of Adult Education. A program of education is subject to two possible misunderstandings:

(1) That a person can achieve through a scheme of adult education the result that ought to have been achieved by regular attendance at school during his more plastic years.

(2) That adult education is merely a makeshift for a few years after the man enters industry.

Adult education attempts to provide a person the opportunity to make up for neglected opportunities during his childhood and youth, or for opportunities that were denied him because of economic conditions, or failure, due to lack of adjustment between himself and the school. No person would deliberately decide that he could avoid the discipline of the adolescent years and make up for it by this post-adolescent education. No such Aladdin's lamp is available to any individual. The scheme of adult education will necessarily depend on the present accomplishments of the individual. The deficiencies of his earlier education must be made up, and the person entering upon a scheme of adult education will be handicapped to the degree of such deficiencies. He will profit to the degree that he secures the discipline offered by the schools and takes advantage of the opportunities of personal study which his life offers him. Consequently, the scheme of adult education is in no way intended as an alternative scheme for the proper training of boys and girls during their youth.

The other misunderstanding relates to the possibility of viewing adult education merely as a temporary makeshift to make up such deficiencies of early youth. It will do that, and more. It must be regarded, as it is coming to be viewed in England, as a permanent national necessity, an inspirational aspect of citizenship, and therefore should be both universal and lifelong. A British report says:

The necessary conclusion is that adult education must not be regarded as a luxury for a few exceptional persons here and there, nor as a thing which concerns only a short span of early manhood, but that adult education is a permanent national necessity, an inseparable aspect of citizenship, and therefore should be both universal and lifelong.

On Us Is the Responsibility. For each of us the significance of adult education is to remind us that education is a need so long as there is life. We must keep open minds, develop wide and persistent interests, and utilize the opportunities and facilities for

continued education. We must remember, as in all education, that the process is one of self-education, that the responsibility is on us. The things we decide to do exclude us from all the other things we might do. Time becomes the most precious of gifts. Pastime loses its meaning. Life becomes a conscious self-direction for the highest ends of human existence. E.A.F.

Related Subjects. In these volumes, see the general article **EDUCATION**, for various discussions of the general topic, and the list of other educational features which appear in their alphabetical order throughout the books. This list appears at the end of the article **EDUCATION**.

ADULTERATION OF FOODSTUFFS AND CLOTHING. That the nature and quality of the food and clothing distributed in any community have an important bearing on the health of its citizens is recognized in all civilized countries. Laws have to be enacted to protect consumers from impure foods and fraudulent products of clothing manufacturers. The following article indicates the character of such protective legislation. See, also, **PURE-FOOD LAWS**.

Foods. Foods serve two main functions in the human body. In the first place, the body structure, such as bone, muscle, skin, blood, etc., must be built up from the food which is consumed. The food must therefore not only contain all the elements found in the body, but these elements must be present in the food in sufficient quantity to supply the needs of the body. The elements must also be properly combined with each other in the food, in order to provide nourishment suited to the human system.

There is a great deal of evidence to show that the poor teeth of many people is due to the consumption of refined foods from which the coarser portions containing the mineral constituents necessary for the growth of the teeth have been removed. At the same time, foods may contain all the elements necessary to build the body and yet lack certain substances known as vitamins (see article in these volumes under that title). These nutritive factors are present in exceedingly minute quantities, but they are essential to growth and health. One of the earliest observations of disease caused by the absence of these minute traces of vitamins was the occurrence of the disease known as beri beri, among peoples subsisting largely upon rice. The disease was shown to be due to the consumption of polished rather than unpolished rice. When the thin outer coating of rice was removed, the necessary vitamin as well as other necessary elements were lacking in the diet. When unpolished rice was consumed, health returned. If the diet had consisted of a variety of foods, the difficulty would not have occurred, as the vitamins are very generally distributed,

particularly in vegetable foods. Some vegetable foods should be eaten raw in the form of salads, as cooking destroys some of the vitamins. Anaemic conditions are often due to the lack of green vegetables in the diet. Such foods are an excellent source of the iron needed in the diet.

Energy Furnished by Food. In the second place, the food must furnish the energy which is required by the body to carry on its varied activities. This includes not only the external activities, such as walking or physical labor, but also the internal activities, such as breathing, the circulation of the blood, digestion, etc. For the average man, the internal activities consume about twice as much energy as the external activities. Energy must also be constantly supplied to compensate for that given out as heat, because it is necessary to maintain the body temperature at the normal point of $98\frac{1}{2}^{\circ}\text{F}$.

During muscular activity of any kind, about two-thirds of the total amount of energy expended is given out as heat, and only about one-third as mechanical energy. For this reason, a physically active person becomes too warm and the excess of heat must be removed, which is accomplished by the evaporation of perspiration from the skin. The heart must force the blood to the surface of the body in order to cool it. The energy for all of these activities must be furnished by the food. For adults this is the most important function of food. The nutritive value of food depends, therefore, upon the amount of energy which it contains, as well as upon the presence of constituents which serve to build up the tissues of the body. If the nutritive value of food has been reduced in any way, the food has been adulterated. Many staple foods are at times adulterated in this manner.

Condimental Foods. The flavor and appearance of foods are also important, because these qualities add to the digestibility of foods. Indeed, many foods are used only for the agreeable odor or taste which they impart to other foods. This is especially true of spices. The flavor of foods is very largely influenced by the climate in which they are grown, as well as the method of cultivation and preparation for the market. For this reason, it is illegal to sell a food represented as having been produced in a given country or locality when it has been grown or produced elsewhere. Flavoring or coloring an article of food so as to make it appear better is also illegal and fraudulent, unless this fact is stated on the label, that all may read the truth.

Preservatives. The addition of a poisonous ingredient to foods, no matter in how small quantity, is also illegal and is classed as adulteration. It is seldom that highly poisonous substances are added to foods except in minute

quantities, but many substances which injure the health have been added in small quantities as preservatives or coloring matter. The addition of preservatives is objectionable, even though the preservative itself is harmless, because in many cases the preserved food is inferior to fresh food in flavor, digestibility, nutritive value, or wholesomeness. While most preservatives have been found to be poisonous substances, benzoate of soda has been found to have no bad effect when taken with foods in the amounts necessary for their preservation; but under commercial conditions, foods prepared with this or other preservatives are inferior to foods to which preservatives have not been added.

Artificial Coloring of Foods. Coloring matter, either aniline dyes or vegetable coloring, is frequently added to foods. This is done for two distinct purposes—to improve the appearance of natural foods or to enable an artificial product to be sold as a natural product. For instance, pure butter is frequently colored because most people prefer yellow to white butter. It has also been shown that the yellow butter produced in the spring, when cattle feed on grass, contains a larger percentage of vitamins, and therefore is more valuable. On the other hand, artificial butter, such as oleomargarine, is often colored so that it may be sold as butter. The latter use of coloring matter is fraudulent, while the former is considered legitimate if the coloring matter is harmless. (See subhead, *Butter and Its Substitutes*, below.)

A considerable number of vegetable dyes are known which are entirely harmless. As the result of a careful investigation made by the United States Department of Agriculture, it was found that there are seven aniline dyes which are entirely harmless when pure. Any desired color may be produced by some one of these dyes or a combination of two or more of them. However, unless these dyes are manufactured with great care, poisonous substances, such as other dyes or arsenic, will be present. For this reason, when these dyes are to be used in foods, they are tested by the government, and a certificate is given that the lot tested is pure. Such tested dyes are known as certified dyes, and may be used in foods where there is no intention to deceive.

It is also illegal to sell the flesh of diseased animals, and decayed or decomposed fruits or vegetables. To guard against such sales, foods are inspected by national or local health officers.

Milk. Milk owes its value as a food to the presence of butter fat, casein, milk sugar, and mineral matter. It is adulterated when the fat has been removed as cream, or when it has been diluted by the addition of water. Most civilized countries have passed laws speci-

fying the percentage of fat and water which must be present in milk which may be sold. Usually not less than three or three and one-half per cent of fat is required, and not more than eighty-seven or eighty-seven and one-half per cent of water may be present in milk. Generally, thin milk is produced by skimming or watering, but occasionally cows are found which naturally produce milk with less fat than required by law. The sale of such milk is illegal. The addition of a chemical preservative such as formaldehyde or borax is also illegal. The greatest danger from the consumption of milk arises from the presence of disease germs such as the tuberculosis, typhoid, or diphtheria germs. Milk produced with the best-known precautions against the entrance of these germs is known as certified milk.

In order to guard against the presence of disease germs in milk, it is often pasteurized. This process does not reduce its food value or digestibility, except for infants or invalids, for whom certified milk is often preferable.

Butter and Its Substitutes. Pure butter must not contain an excessive amount of water due to the addition of a large amount of salt. It may be colored with a harmless dye. An inferior grade of butter known as *renovated* or *process butter* is prepared from rancid or inferior butter. Renovated butter is wholesome, but it is inferior to good creamery butter and should not be sold as such.

Oleomargarine is an artificial substitute for butter which is manufactured from various animal and vegetable fats, to which some milk has been added. There is, therefore, always present in oleomargarine some true butter fat. While wholesome and nutritious, oleomargarine is inferior in flavor and probably in digestibility to butter, and it is therefore illegal to sell it as such. If it is colored yellow, it is difficult to distinguish it by appearance, taste, or odor from butter.

A number of other substitutes for butter have been developed; most of these are compounded from vegetable oils. This has been rendered possible by the development of a process known as *hydrogenation of oils*, by which oils are converted into solid fats. The vegetable oils are quite as wholesome and nutritious as the animal fats and are considerably cheaper, but are not suitable for culinary use because they are not solid. The hydrogenated oils are excellent substitutes for lard and butter for cooking purposes. These fats are excellent foods, and their sale is entirely legitimate if there is no misrepresentation.

Oils. Olive oil is the choicest of the vegetable oils and has been used as food for centuries. Many other vegetable oils are quite as nutritious and wholesome, but are not equal to olive oil in flavor. Olive oil is the most expensive of these vegetable oils, and for

this reason other oils are at times mixed with it or substituted for it. In the United States, cottonseed oil is the most largely produced vegetable oil. The most common adulterant of the olive oil sold in the United States and Canada is cottonseed oil.

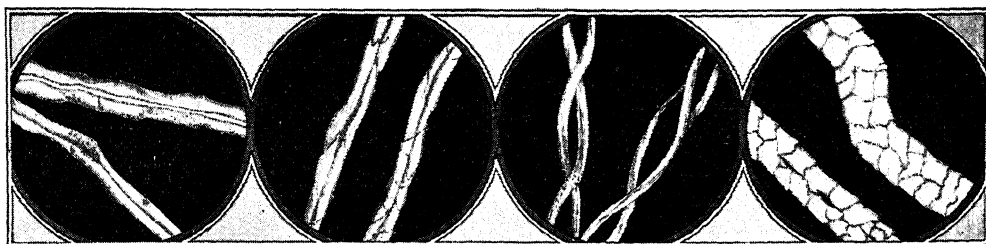
Meats. Meats and meat products are at times subjected to adulteration by the addition of preservatives, borax and sulphite of soda being commonly used for this purpose. Sulphite of soda gives a bright red color to meat which is decomposed and unfit for consumption. If the preservative were not added, the odor and appearance of the meat would give evidence of its condition.

Fruit Preserves. Jellies, jams, and preserved fruits have been subjected to a great deal of adulteration. Glucose or corn syrup has been used instead of sugar. This reduces the sweetness of the food, but does not affect its nutritive value or wholesomeness, and prevents crystallization of the sugar. The fruit or fruit juice being the most expensive ingredient, it is replaced by artificial flavoring and coloring matter. In some cases the fruit pulp from which the juice has been extracted is used for the manufacture of jams, artificial flavoring and coloring matter being added. Preservatives are added to avoid the prolonged and expensive heating necessary for sterilization.

Flavoring Extracts and Spices. Imitation flavoring extracts are very largely sold. This is especially true of vanilla, as the vanilla bean is very expensive. Ground spices have been adulterated by the admixture of a great variety of ground material, such as nut shells, sawdust, etc. In some cases, as with cloves and ginger root, the exhausted spice is sold, the flavoring matter having been extracted.

Candies. A great variety of ingredients may be legitimately used in candies. Glucose is a perfectly wholesome and nutritious substitute for sugar. At times, poisonous coloring matter has been used, but in recent years only the pure certified dyes have been commonly employed. The excessive consumption of candy is probably more injurious than any ingredient present in it.

Clothing. Cotton and Linen. The fibers used in the manufacture of clothing are cotton, linen, silk, rayon, and wool. The cheapest of these is cotton, and for this reason cotton is used as the adulterant of the other fibers. Cotton and linen are vegetable fibers, and are very similar to each other. The cotton fiber is obtained from the seed pods of the cotton plant, while the linen fiber is obtained from the stems of the flax plant. The latter is cultivated both for the fiber and the seed, which is known as linseed. The linen fiber is longer, has a somewhat more silky appearance than the cotton fiber, and is therefore considered more valuable, although in some European countries



Linen

TYPICAL FIBERS, MUCH ENLARGED
Silk

Cotton

Wool

where linen is the cheaper, the substitution of linen for cotton is considered adulteration.

Wool. Wool is produced from a great many species of sheep and goats, and its fiber differs very largely in length and texture, depending upon the locality and the animal from which it is produced. Cloth may be "all wool" and yet be of very inferior grade as compared with cloth made from a better quality of wool; so one piece of cloth may be worth several times as much as another, both of which are "all wool."

The amount of wool produced is sufficient to supply only about one-tenth of the demand for clothing. For this reason the wool in cast-off garments is used over again. Processes have been developed by which the wool in an old garment is separated from the cotton or other fibers present, cleaned, carded, and again spun into yarn. This second-hand woolen fiber is called *shoddy*. It is but little inferior to the particular grade of wool which it originally constituted. Shoddy produced from cloth made of a high grade of wool of long fiber is far superior to a low-grade wool of short fiber. The excellence of woolen cloth does not depend so much on whether shoddy or new wool has been used in its manufacture as upon the length and texture of the fibers of the wool or shoddy employed.

Silk. Silk is the fiber of which the silkworm forms his cocoon. This worm spins a continuous thread composed of two strands, which is wound into a cocoon by the movements of the worm. The fiber is solid and therefore has a gloss which is far superior to that of the vegetable fibers or wool, which are hollow and flat. By a chemical process the cotton fibers may be so changed as to give a gloss somewhat similar to that of silk. This is known as *mercerized cotton*. Several processes have been developed by which a fiber closely resembling natural silk is produced from cotton linters, or even from cellulose derived from wood fiber. Like silk, rayon is produced as a long, continuous fiber which may be miles in length. Being produced mechanically, it is more uniform in diameter and strength than silk. It is superior to silk in gloss and brilliancy. It has the disadvantage that when wet it in-

creases in size and loses considerable strength, but it returns to its original size and strength on drying. This property has been found to be advantageous when rayon is used for production of underwear, as it readily absorbs the perspiration and does not turn yellow, as is the case with silk.

Rayon is used very largely in combination with cotton and silk. Its use is rapidly extending, the amount produced and used being more than double that of silk. It is illegal to sell any of these mixed products as pure silk.

Silk is subjected to a process of *loading*, which if carried to excess is objectionable. Natural silk in its raw state is covered with a gummy substance which gives it a harsh feeling and a yellow, unsightly appearance. When this material is removed by washing the skeins of silk, about four ounces are lost per pound of silk. The fiber is then brought back to its original weight by the deposition of tin phosphate. The tin used for this purpose is obtained by detinning tin cans and other waste tin scrap. Silk fiber may be so "loaded" with this tin that the original pound of fiber may become almost double that weight. Such silk feels heavy but does not wear well. This excessive loading must be considered adulteration. Rayon, on the other hand, is not subjected to loading. j.c.o.

Related Subjects. The reader is referred in these volumes to the following articles:

Butter	Food	Olive Oil
Candy	Linen	Rayon
Cellulose	Milk	Silk
Cotton	Nutrition	Vitamins
Flax	Oleomargarine	Wool

ADVENTISTS, several religious sects which, accepting the general doctrines of Christianity, expect that Christ will soon reappear in person and bring the world to an end. Belief in such a second coming existed before the formation of the Adventist Church, for there was a general expectation throughout Europe that the world would be brought to an end in the year 1000, and preachers have arisen at intervals ever since, who declared that the coming of Christ was at hand. However, the sects known as Adventists all arose from the preaching of William Miller (1782-1849), who began in 1831 to prophesy the end of

the world and the establishment of Christ's kingdom between March, 1843, and March, 1844. He based his belief on the Biblical prophecies, having calculated that all the signs and wonders which the book of *Daniel* and other books prophesied had come to pass. Since the middle of the nineteenth century Adventists have simply waited for the early appearance of Christ and have not tried to fix the date.

Growing out of the original movement, the Advent Christian Church was organized in 1845; the Seventh-Day Adventists, the largest branch, in 1860; the Life and Advent Union, in 1864; the Church of God, Adventist, in 1866, and the Churches of God in Christ Jesus, in 1888. The total membership of all Adventist bodies exceeds 136,000, of which the Seventh-Day Adventists' strength is slightly more than 100,000, in 2,250 churches.

Seventh-Day Adventist. This sect subscribes to no formal or written creed; the Bible is its rule of faith and practice. It declares the seventh day of the week, from sunset on Friday to sunset on Saturday, to be the Sabbath; accepts immersion as the only proper form of baptism; believes that the personal, visible coming of Christ is near at hand, and is certain to precede the millennium (which see); teaches that at the close of the millennium Christ with His people will return to the earth, the resurrection of the wicked will occur, and Satan with his followers will meet final destruction; declares the earth will then be made the eternal abode of the people of God. The washing of one another's feet, the men and women meeting separately, is observed quarterly.

The time of the advent has never been definitely set, but the belief is held that it is near.

ADVERB. The part of speech known as the *adverb* performs for the verb the same office that the adjective performs for the noun; it limits and modifies its meaning. The verb *walk*, for example, calls up only a general image of the action; but add to it the word *painfully*, and immediately the mental picture assumes definiteness. The word *adverb* comes from the Latin and signifies *joined to a verb*, but an adverb may also be used to modify an adjective or another adverb.

Classes of Adverbs. Adverbs are classified (1) as to their use in the sentence, and (2) as to their inherent meaning, without regard to the special work they perform. From the standpoint of *use*, there are three classes:

1. *Simple adverbs*, used merely to modify; as, He left *abruptly*; She spoke *lovingly*. These are derived chiefly from adjectives and participles by the addition of the suffix *ly*.

2. *Conjunctive or relative adverbs*, which not only modify but also connect the adverbial clause with the body of the sentence; as, I do not know

when he left. The principal conjunctive adverbs are the following.

when	after	out
where	whence	why
as	before	wherever
while	till	whereby
there	until	wherefore

3. *Interrogative adverbs*, which introduce a question; as, *When* did he leave? The most important of these are:

when	where	why	how
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From the standpoint of *meaning*, there are six principal classes of adverbs, and two of lesser importance:

1. *Adverbs of time*, answering the question *when*; as—

now	before	again
yesterday	afterward	to-morrow
instantly	often	still
now and then	to-day	by and by
then	heretofore	ever and anon

The last two phrases, and others of similar construction, are sometimes termed *phrase adverbs*.

2. *Adverbs of place*, answering the questions *where*, to what place, from what place; as—

where	out	yonder
here	down	whither
there	up	hither
anywhere	away	everywhere
back	whence	within
backward	without	elsewhere

3. *Adverbs of degree*, answering the question to *what extent*; as—

very	little	sufficiently
quite	much	last
too	more	least
exceedingly	most	scarcely
almost	no	hardly

The word *the* is also an adverb of degree in constructions like "*The earlier the better*," where it precedes the comparative form of the adjective.

4. *Adverbs of manner*, answering the question *how*, or in what way; as—

how	ill	fast
so	badly	helpfully
thus	aloud	one by one
well	quick	little by little

5. *Adverbs of cause*, answering the question *why*; as—

why	therefore	hence
thus	wherefore	whence

6. *Adverbs of number*, answering the question *how many*; as—

once	twice	secondly
thrice	first	thirdly

7. *Adverbs of assertion*, including the *affirmative* adverbs *yes*, *yea*, and *aye*, and the *negative* adverbs *no*, *nay*, *not*, *never*. When *yes* or *no* stands alone, it is equivalent to a full sentence and is called a *sentence adverb*.

8. *Modal adverbs*, which modify not a single word but an entire clause, as in the sentence, "Perhaps he cannot find the way." The following are the principal adverbs so used:

certainly	probably	nevertheless
surely	possibly	consequently

Comparison of Adverbs. Only the adverbs of degree and manner, with a few adverbs of time, like *soon*, *often*, and *early*, are subject to comparison. Like adjectives, these are compared by three different methods:

Comparison by Adverbs. The most frequent method of comparing adverbs is to prefix *more* or *less* for the comparative and *most* or *least* for the superlative; as—

POSITIVE	COMPARATIVE	SUPERLATIVE
cheerfully	more cheerfully	most cheerfully
clearly	less clearly	least clearly

Comparison by Endings. A small number of adverbs which have the same form as the corresponding adjectives are compared by adding the suffix *er* or *est*; as—

POSITIVE	COMPARATIVE	SUPERLATIVE
deep	deeper	deepest
early	earlier	earliest
fast	faster	fastest
hard	harder	hardest
high	higher	highest
long	longer	longest
loud	louder	loudest
often	often	oftenest
quick	quicker	quickest
soon	sooner	soonest

Thus, it is correct to say, "He dug *deeper*," instead of "He dug *more deeply*"; "He sang *loudest*," instead of "He sang *most loudly*."

Irregular Comparison. Just as there are some adjectives that are compared irregularly, so there is a similar list of adverbs; as—

POSITIVE	COMPARATIVE	SUPERLATIVE
badly	worse	worst
far	farther	farthest
forth	further	furthest
ill	worse	worst
late	later	last (latest)
little	less	least
much	more	most
nigh (near)	nearer	next
well	better	best

Incapable of Comparison. It is evident that there can be no comparison in the case of such adverbs as *here*, *then*, *thus*, *once*, *yesterday*, and others of similarly absolute meaning. See COMPARISON.

Position of the Adverb. The general rule is to keep the adverb as close as possible to the word it modifies. If we say, "Look at the flower you are holding *closely*," we convey an idea probably not intended. The adverb should be placed next to its verb, making the sentence read: "Look *closely* at the flower you are holding." This is particularly important in the case of such words as *only*, *almost*, *already*, *ever*, *never*, and the like.

Usually the adverb follows the verb; as, "He spoke *cheerfully*." Certain adverbs of time, however, like *often*, *frequently*, *seldom*, and others, are generally placed before the verb; as, "We *seldom* speak of the matter and *never* refer to it in her presence." The adverb precedes a transitive verb in order to avoid sepa-

rating it from its object, unless the sentence is very short; as, "He *rapidly* reviewed the facts that had been brought out."

Where adverbs of different classes are employed in the same sentence, they should be used in the following order: time, place, manner; as, "The boat *generally* gets us *here* very *quickly*," not, "The boat gets us *here generally* very *quickly*." The principal adverb is the one that denotes time.

Common Errors. Most of the errors in the use of adverbs arise from incorrect placing and from the use of adjectives for adverbs or adverbs in place of adjectives. The following paragraphs embody some of the more frequent mistakes; reference should also be made to the errors listed under ADJECTIVE:

The class only read one page, for The class read only one page. The first construction gives the idea that the page was only *read*—not copied or recited upon; whereas the thought intended is that the class stopped with the reading of that single page.

I don't ever remember to have met him before, for I don't remember ever to have met him before. The *ever* belongs to the verb *to have met*, not to *remember*.

He promised to faithfully stick to his work, for He promised to stick faithfully to his work. Unless there is a definite advantage to be gained from "splitting the infinitive," there is no object in violating the ancient rule that the verb must not be separated from its sign, *to*.

Is he here already? for Is he already here? The adverb of time should precede that of place. This impropriety is especially common in the speech of Germans just learning the English language.

He felt badly because he had played so poor, for He felt bad because he had played so poorly. The verbs of the senses—feel, see, hear, smell, and others—are followed by adjectives, not by adverbs, because they describe conditions rather than actions. See other examples under ADJECTIVE.

You look good, for You look well. *Good* and *well* are both adjectives, but the latter expresses a condition of health, whereas *good* refers to moral character. *He looks good* is equivalent to saying that he looks like a good man. *He looks well* implies that he is in good health.

They were very excited, for They were very much excited; He is a very educated person, for He is a very well educated person. It is a rule of grammar that the adverb *very* must never be used directly to modify the perfect participle; there must be an intervening adverb such as *much*, *well*, or *greatly*. It can, however, modify the present participle; as, *It was very exciting*.

He returned back, He advanced forward, He fell down, for He returned, He advanced, He fell. The adverbs are superfluous because the idea in each case is fully expressed in the verb.

The orator spoke contemptibly of the policies of the administration, for The orator spoke contemptuously of the policies of the administration. The policies may have been contemptible, but the orator treated them with scorn, hence contemptuously.

He pointed out, firstly, that the measure was un-called for, and, secondly, that it was actually harmful, for He pointed out, first, that the measure, etc. Note

that *first* is included in the list of adverbs of number and therefore has no need of the suffix *ly*.

He didn't have hardly enough to eat, for *He didn't have enough to eat*, or *He had hardly enough to eat*. The adverb *hardly* has the force of a negative, and a double negative is equivalent to an affirmative.

This here book has more pictures than that there one, for *This book has more pictures than that one*. The adverbs *here* and *there* are superfluous, since the pointing out is done by the adjective pronouns *this* and *that*.

They go more oftener than I do, for *They go oftener than I do*. *More oftener* is a double comparative and therefore as much to be avoided as a double negative.

I distrust him worse than before, for *I distrust him more than before*. *Worse*, the comparative of *bad* or *ill*, should not be used for *more*. E.U.G.

Outline on the Adverb

- I. Definition
 - (a) Used with verb, adjective, or adverb
 - (b) Limits or modifies
- II. Classes
 - (a) As to use
 - (b) As to meaning
- III. Comparison of adverbs
 - (a) By prefixed adverbs
 - (b) By endings
 - (c) Irregular comparison
 - (d) Incapable of comparison
- IV. Position of the adverb
 - (a) Following the verb
 1. Exceptions
 - (b) Compound tenses and voice
 - (c) Precedence in a series
- V. Common errors

ADVERTISING. The volume and prevalence of modern advertising, with its varied appeal and utilization of the latest discoveries, tend to make us forget that the principle of advertising is as old as human nature itself. Wherever and whenever men have had to compete with others in their efforts to market their goods or their services, advertising in some form has been the seller's aid. Methods may change, new avenues of approach may be opened from year to year, the emphasis of the appeal may vary with the changing times, but the underlying motive is permanent and ages old—that the seller must invite the attention, win the interest, and secure the conviction of the buyer.

In its scope, of course, advertising has broadened immeasurably. Besides selling, its principal objectives are to win "customer acceptance" for merchandise, to familiarize the public with brands, trade-marks, slogans, and containers, to influence dealers to aid in the distribution of products, and to build good will for goods, persons, organizations, and principles.

A survey of the field of advertising impresses one with the fact that it represents a cross-section of the world of to-day. No fictitious

narrative is more colorful than the story of modern advertising; no *Arabian Nights* tale is more romantic than the record of its achievements. From its crude beginning as a mere announcement of something offered for sale, advertising has become a scientific, artistic, and complex presentation of the sales arguments of every manner of products—foods, clothing, furniture, real estate, automobiles, theatrical productions, escorted tours, and practically every other necessity, comfort, or luxury of our age.

It is used to further the ambitions of political candidates, to arouse interest in religious and social questions, to awaken civic pride, to discourage crime. In the United States, where the yearly turnover exceeds a billion and a half dollars, advertising has helped to build the largest industries, changed standards of living, and created new habits. Its influence reaches to every person in the land.

Avenues of Approach. The statement that the advertising bill for the United States alone is a billion and a half dollars a year may well lead the reader to wonder how a sum so great is distributed. But the avenues by which the advertiser reaches his customers are both numerous and varied. They range, indeed, from a crude handbill, by which a small local store advertises a bargain sale, to the impressive color spread in a high-grade magazine, costing thousands of dollars per page. The handpress and the mammoth rotary printing machine, the neatly lettered card and the huge electric sign, the moving picture and the voice of the radio, the airplane tracing smoke letters in the sky—these suggest but a few of the manifold avenues of approach available to the modern advertiser. It will be interesting to consider some of these advertising media in more detail.

Magazines and Newspapers. With the exception of a few periodicals supported by endowments or subsidies, newspapers and magazines derive most of their income from the advertising admitted to their columns. Over half of our huge advertising bill is credited to these publications. In many instances, their cost to their readers is less than that of the blank paper used in their manufacture. In fact, there are high-class technical magazines, with lists of "free subscribers" selected from the trade, which find it more profitable to charge nothing for their issues than to maintain circulation departments.

By their editorial policies, magazines attract certain classes and types of readers. These determine *quality* of circulation. The *quantity* of circulation achieved by a periodical is determined by the kind and extent of its appeal, and its methods of obtaining subscriptions. The size of a subscription list may be learned from sworn statements, from postoffice receipts, or, as is true of the better class of publications,

from the Audit Bureau of Circulations (A. B. C.), the reports of which are accepted without question. Rates for advertising are determined chiefly by the quality and quantity of circulation, but also by competition, and by the law of supply and demand. In the United States, the rates per page charged by leading magazines reach as high as \$15,000 for a single issue.

Newspapers, which usually have local or zone circulations, rather than those of national scope, range from the small weekly of a rural community to the powerful metropolitan daily. The latter is a great corporation; it may own the forest that supplies its wood pulp, the paper mill that makes its newsprint, a skyscraper home plant, and oftentimes a broadcasting station, besides maintaining an army of correspondents scattered over the world. Yet most newspapers, from the smallest to the greatest, are largely financed by their advertising. Because the life of a newspaper is but a day, while a magazine may be read for months, and because the paper and printing of the former are the less costly, newspaper advertising rates are lower than those of magazines. The basis of calculation is called an *agate line*, with reference to agate type. This is type so small that fourteen lines of it, measured by depth, occupy one inch of column space. Newspapers of large circulation charge about one-tenth of a cent per agate line for each thousand of circulation. The rates of the great American dailies range from eighteen cents to \$1.25 per agate line. Sunday-edition rates have gone as high as \$1.75.

Magazines of large general circulation charge from one-third to two-thirds of a cent per line per thousand readers, but the rate is higher when the quality of circulation is exceptional. Eight dollars a line, or \$112 an inch, may be considered an average charge in a general magazine with a circulation of 2,000,000 or more. A double-page advertisement in such a magazine may cost close to \$20,000 for a single insertion, if in colors.

Some publications with very large circulations use the *milline* rate, computed on the basis of each million of readers.

Outdoor Advertising. More than \$100,000,000 a year is spent by American advertisers who utilize outdoor devices, such as posters or billboards, painted bulletins and walls, and electric signs. In this category, too, are included window displays and advertisements shown in street cars, suburban trains, and interurban coaches.

Anyone who travels through the country by train or by automobile is impressed by the universality of the billboard. In the advertising profession, the structure supporting the display is called the *panel*, and the display itself is the *poster*. The sizes are now standardized, the panel being 11 feet high and 25 feet wide, and the poster 10 feet by 20 feet. There has

been much criticism of this device on esthetic grounds. Undoubtedly, the charm of the country landscape or a fine residence street is often marred by conspicuous and too frequent billboards. To overcome the more obvious faults of billboard advertising, the Outdoor Advertising Association of America has agreed upon the following regulations:

1. No structures to be erected which will be considered hazards to traffic.
2. No structures to be erected on purely residential streets.
3. No structures to be erected which mar or impair scenic beauty.
4. No structures to be erected within the limit of state or municipal highways.
5. Structures to be erected only upon land owned or leased by member companies.

PREPARATION OF COPY

1. No copy to offend moral sense of public.
2. No copy which infringes on or induces violation of the Constitution of the United States or any laws or ordinances thereof.

Chiefly through the activities of this association, posters have been improved to such an extent that the best deserve to be regarded as real contributions to advertising art. Such a theme as foreign travel or landscaping lends itself readily to artistic display, but even the common products of everyday use may be given a tasteful and pleasing setting. If equally good taste is shown in the choice of location, the billboard will arouse less criticism.

Equally effective for display purposes are the bulletins and walls upon whose surfaces advertisements are painted. Bulletins are erected on the ground, on the side walls of buildings, and on roofs, a roof location being known as a *preferred* position. The structure itself has a metal frame and facing, and if surrounded by a decorative border, it becomes a *de luxe* bulletin. Painted bulletins may or may not be illuminated. Illuminated structures are equipped with electric reflectors, placed at the top or at the top and sides of the frame. Lighted from dusk to midnight, the illuminated bulletin is visible for about seventeen hours a day. Manufacturers of automobiles, radios, and other high-class devices specialize in this form of outdoor display. Contracts are signed on a yearly basis, and prices are quoted as so much per bulletin per month. Illumination, general upkeep, and three paintings a year are included in the charges, with a change of copy at each painting if desired.

The painted wall makes an effective display, if a conspicuous location is chosen and the wall is in a congested area. An advertisement painted on the side of a tall building with good clearance is visible many blocks away.

The outdoor device that has the highest attention value, however, is the electric sign. Most of these signs are erected on the roofs of buildings situated at points of great visibility.

The framework is usually made of structural steel, and the frame containing the words or designs is outlined with light-globes and made of sheet iron. An endless variety of colors or color combinations can be obtained by the use of different colored globes. Mechanical devices are used to turn the current on or off, and to produce a flashing of light in various parts of the display. The dazzling effect of the electric signs on Broadway, New York, has won that famous street the popular name of the "Great White Way."

One of the most artistic forms of outdoor advertising is the window display of high-grade stores and shops. These displays consist of elaborate settings, arranged by specially trained window trimmers, who command high salaries. Practically all merchants utilize this method of approach, and banks are also specializing in window advertising, urging the importance of saving, investing, and so on.

Street-car and interurban display has become an important factor in the total volume of advertising, because these railways carry hundreds of millions of passengers a year. Since the placards carrying the display matter are so placed that no passenger can help but see them, this medium of approach gives very wide publicity to whatever product is advertised.

Direct-Mail Advertising. It is estimated that twenty-five per cent of the sum spent for advertising in the United States is accounted for by the direct-mail approach. When this medium is utilized, prospective customers receive direct from different kinds of business houses, letters, circulars, catalogs, mailing cards, and advertising novelties of varied character. These novelties include calendars, blotters, pencils, and a thousand and one similar articles, each usually bearing the imprint of the advertiser, and they are distributed with the idea of winning good will and publicity. A vast amount of business is done by merchandise houses that solicit and sell through the medium of the mail. These mail-order houses, as they are called, issue catalogs with descriptions and prices clearly stated, and the customer, relying on the good faith of the house, sends in his order by mail, without first inspecting the goods.

Mail advertising does not in every case urge the customer to buy directly from the company soliciting his patronage. Often the recipient is told that he can purchase the product at local shops; sometimes he is told that a salesman will call upon him; or the letter or circular may be sent merely to arouse his interest and persuade him to write for further information. It is thus apparent that mail advertising may be a combination of different forms of approach.

Moving Pictures. When moving pictures first began to draw patrons to the little neighborhood theaters, early in the present century,

local merchants were quick to see the possibilities of the screen as an advertising medium. This method of advertising commodities is now almost obsolete, however, though all the moving-picture houses of to-day make use of the screen to gain publicity for their coming attractions. There is also a certain amount of indirect advertising in the news reels that form a part of every "movie" program, but in the main, the modern moving-picture theater exists for entertainment, and much direct advertising by outside interests would be resented by the patrons.

Radio. It is radio that is becoming the great advertising medium of the modern age. While this type of advertising is still too young to have developed a standard technique, the advantages of broadcasting are so marked that radio is already established as a principal channel of publicity. Stations are owned by newspapers, manufacturing corporations, church organizations, public utilities, and others. The ever-recurring mention of the owner in the announcements serves to make the company or organization name familiar to countless listeners. Most stations make a practice of selling time to those who wish to advertise via the air, but direct selling announcements are not wholly approved by the Federal Radio Commission. Undoubtedly, time will bring a general agreement as to the ethical standards for broadcasting, and these will be followed by all reputable houses and stations.

The Science of Advertising. It has been said that the least and last thing in advertising is the *writing* of the advertisement. Before an advertisement can be prepared, a considerable investigation and study, both of the market for the product and of the product itself, must be made. *Who* will buy it? *Where* do they live? *How much* will they buy of it? *What* are these people buying now to serve the same purpose? A psychological analysis must often be made of the prospective customer's motives, desires, instincts, buying habits, and financial and social circumstances. These facts may be gathered in the field or from authoritative reports.

The product must be analyzed to discover its possible appeals. What raw materials enter into its production, what are the processes of manufacture, what are its uses and distinguishing qualities, its price and relative value, its description and competition and *advantages*? These appeals must be studied and graded in the order of their importance; some must be discarded; and those selected must be fitted to the customers' needs as previously determined.

Then the advertisement itself can be constructed. Its selling psychology generally parallels that in personal salesmanship. Headlines and pictures are used to attract interest and to develop sufficient attention so that the



THE CALIGRAPH!

IT IS TO THE PEN WHAT THE SEWING MACHINE IS TO THE NEEDLE!
The writing is done by touching keys, and its work is incomparably superior to writing in ink—swift, accurate and compact. A person can use it at AT SIGHT, and with a few weeks' practice can more than double the speed of the most rapid penman.

It can be operated with one finger of either hand, or with all fingers, and by the operator in any position.

IT SAVES THE EYES! It helps the brain! It economizes time, stationery, nerve, and clerk-hire.

The writing machines are now made FAR better than they were three years ago, and at about half the cost. For particulars address

L. H. HALELOCK,
Worcester, Mass.

Living Testimony of the Highest Order to the Merits of the

McPHAIL IMPERIAL UPRIGHT PIANOS.



McPHAIL & CO. Upright and Square Pianos.

Lowest Price for Best Quality.

From Mr. Carl Zerrahn, the eminent conductor,
Bremen, Feb. 14, 1886.

It gives me great pleasure to state that I have acquired the McPhail Upright Piano, and find them most excellent instruments. The tone is even and musical throughout, with a singing quality rarely to be met with in pianos of this class and construction at prices so moderate and intelligent use make them.

CARL ZERRAHN.

Dr. George F. Root, a distinguished musical author, says of the McPhail Upright Piano:
The tone is sweet and full; speaks roundness and fullness. I have never heard before and, as to singing quality, it is unsurpassed in any instrument which I have ever played upon. I have never before conducted a piano so perfect in every respect.

620 Washington Street, Boston.

Mrs. Stowe's New Story

POGANUC PEOPLE.

By Mrs. H. B. Stowe.

Author of "We and Our Neighbours," "My Wife and I," "Uncle Tom's Cabin," etc.



"Will be relished by all lovers of a good story."—Salem Post.

CROWN 8vo. ILLUSTRATED. CLOTH \$1.00. PAPER 50 CENTS.

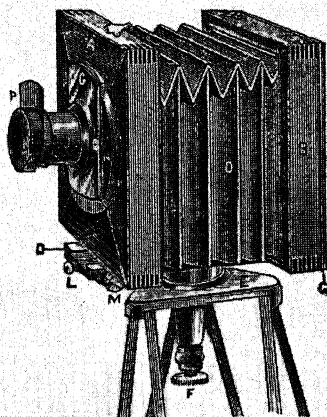
ROSE-BELFORD PUBLISHING CO.,
TORONTO.

J. RUSSELL & CO.
GREEN RIVER WORKS
AMERICAN CUTLERY

DEPA WATKINS 1884

SUPERIOR TABLE CUTLERY

Amateur Photography



THE VACATIONS.

Pleasure, and Profit.
Outfits from \$16 Upward.
and sent C. O. D. Full information with
for the work.
MAKE PHOTOGRAPHS."
TO ANY ADDRESS.

AND SUPPLIES.

W. & D. DINEEN,
FASHIONABLE
HATTERS AND FURRIERS,
Corner of King and Yonge Sts., Toronto.

Advertisements of a Former Day. It will be interesting to compare these appeals with modern advertising inking in display and often in color. The above examples appeared in newspapers and magazines from fifty to sixty years ago.

advertisement will be read through. A spirit of sincerity, enthusiasm, and allure must build up desire and conviction. And incidentally, through the use of trade-mark, cartoon, or slogan, the article will be remembered and identified.

By experience and by test, the size of the advertisement, the medium (newspaper, magazine, etc.), the layout (artistic composition), the typography, and other details of the advertisement are determined. By test and by experience, it is found how often to repeat the advertisement, how to weigh cost, and how to calculate the appropriation in relation to a forecast of the results. Repeated tests have shown that very few advertisements are read through—most of them are hurriedly glanced over. So the substance of the message must be told in picture and headline in an effort to intrigue the reader to continue reading. There have been successful advertisements containing only a word or two, and there are notably successful ones crowded to the border with a long message in the smallest type.

Some advertisements are *suggestive*, appealing to the emotions, and others are *argumentative*, appealing to the reason, with the *reasons why* of the product. Advertisements prepared for newspapers must use larger, more legible type, and illustrations which lend themselves to the coarse print paper. Those prepared for the better class of magazines which use costly enameled paper permit fine-screen halftone illustrations, frequently in full-color process.

Advertising Agencies. The modern advertising agency dates from 1840, when Volney B. Palmer established an agency in Philadelphia. For many years, advertising agencies were brokers of space in newspapers and magazines. They bought so many pages or columns or lines at the best price they could, and then sold them to advertisers piecemeal, at any rate they could secure.

During more recent years, advertising agencies have developed a highly specialized service for advertisers, and at the same time magazines and newspapers have established fixed rates for their advertising space. To-day it is common practice for advertising agencies, "recognized" by associations of publishers, to secure an "advertising agency discount" of fifteen per cent from the publisher's rate-card rates; this represents the gross profit made by the advertising agency in its operations. Out of this gross profit a modern advertising agency pays the expenses of operating its business.

No more than a negligibly small percentage of national advertisers place their advertising direct with publishers. Nearly all engage the services of an advertising agency to analyze their problems, to investigate markets, and to build the advertising and place it. While most advertisers maintain an advertising depart-

ment and manager, the agency and advertising departments definitely divide the work that is to be done. The advertising manager, frequently in consultation with the sales manager and other executives, represents the interests of the advertiser, while the advertising agency makes all investigations, develops selling, advertising, and merchandising plans, takes care of all details incidental to the preparation of advertisements, makes all contracts with publishers, buys space and positions, pays publishers' bills, and bills the advertiser in turn.

The advertising agency is presumed to have a broader and more varied experience because of its close relationship with a large number of advertisers in many fields, and is expected to bring to the solution of the advertiser's problems an outside point of view which the members of the advertiser's own organization cannot have. Usually the advertising department handles detailed arrangements with dealers, supplying them with material for local newspaper advertising, window displays, etc.

The modern advertising agency has an executive department, a financial department, and an accounting department; the latter takes care of general business details. There are also account executives and contact men, and salesmen who maintain connection with clients of the agency, and in turn see that the agency produces the material required by the clients. The mechanical department handles the preparation and purchase of engravings, and makes decisions on typography and other mechanical details. The art department makes rough layouts and finished drawings, or contracts for these from outside studios. The production, or copy, department produces advertisements and direct-mail material. The merchandising department works with the sales and merchandising managers of the clients in developing sales plans which tie up with the advertising efforts. The space-buying department contracts for space in all media. The checking department notes whether the advertising has appeared properly. The research department makes field and statistical investigations of markets and competitive advertising.

Advertising Associations. The Associated Advertising Clubs of the World is affiliated with the advertising clubs in hundreds of cities. They have established high standards of practice, and their slogan is "Truth in Advertising." Through their efforts and that of their vigilance committee, many abuses, frauds, and questionable practices in advertising have been eliminated or remedied.

The Audit Bureau of Circulations comprises in its membership publishers, advertising agencies, and advertisers. The Bureau makes an independent audit of the quantity, the circulation-building methods, and the character of circulation of magazines and newspapers.

OUTLINE AND QUESTIONS ON ADVERTISING

Outline

I. Its Underlying Motive

- (1) To invite attention
- (2) To win interest
- (3) To secure conviction

II. Avenues of Approach

- (1) Magazines and newspapers
 - (a) Character of circulation
 - (b) Rates
- (2) Outdoor advertising
 - (a) The poster
 - (b) Painted bulletins
 - (c) Painted walls
 - (d) Electric signs
 - (e) Window displays
 - (f) Street-car "ads"
- (3) Direct-mail advertising
- (4) Moving pictures
- (5) Radio

III. The Science of Advertising

- (1) Analysis of the market
- (2) Study of the customer
- (3) Analysis of the product
- (4) Writing of the "ad" itself
- (5) Different appeals

IV. Advertising Agencies

- (1) Purpose and functions
- (2) How organized

V. Advertising Associations

- (1) Different types
- (2) Purposes

VI. Vocational Courses

- (1) Why they are valuable
- (2) Their limitations

VII. The Economic Problem in Advertising

- (1) Objections sometimes advanced
- (2) Proofs of its soundness

Questions

Why has advertising been a business necessity from early times?

What are its principal objectives?

In what sense is it true that everybody is influenced by advertising?

How can some magazines afford to give away their issues instead of charging for subscriptions?

What is meant by *quality* of circulation, and how does it affect the financial status of a magazine?

If a magazine claims to have a certain circulation, how can the advertiser check up on the figure?

If a periodical had a circulation of 50,000 and its rate basis was a third of a cent, how much per agate line would it charge?

What objections are there to billboard advertising? What is being done to offset them?

What are the different purposes of direct-mail approach?

What has been the effect on advertising of the perfection of radio?

Why is it sometimes said that the writing of the advertisement is the last and least thing?

What are the functions of an advertising agency?

Answer the argument that advertising adds to the consumer's expense.

In what way did early advertising agencies control space in magazines and newspapers?

Can you name off-hand five different articles used in the home that you have heard advertised over the radio?

If your favorite weekly magazine charges \$8 per agate line, single column measure, for advertising, compute the cost of an entire page, printed in one color. (Advertisements in two or more colors cost from thirty to fifty per cent more.)

In a magazine, identify an advertisement which is merely suggestive; one which is argumentative.

Subscribers to the services of the Bureau accept its figures as correct.

The American Association of Advertising Agencies, often called the 4-A's, is an organiza-



ON A WALL IN CHINA

These advertisements were photographed in a town 900 miles up the Yangtze River.

tion of most of the leading advertising agencies in the United States who have adopted standards of advertising-agency practice which have been widely accepted even by those outside the membership.

The Newspaper Publishers' Association is an organization to which the leading newspapers of the United States belong, with headquarters in New York City. This association formulates standards of practice on the part of newspaper publishers, recognizes advertising agencies, to whom its members grant the advertising-agency commission, and functions in similar matters which affect the interest of newspaper publishers.

A similar organization in the magazine field is the Periodical Publishers' Association, with headquarters in New York City. Business and agricultural papers also maintain associations.

Vocational Courses. The importance of advertising in modern business, the interest of the work itself, and its possibilities of profit have made the field an attractive one. Leading colleges, especially those with courses in commerce, now give courses both in journalism and advertising. While these are somewhat elementary and lack practical training, there is no better way to get the fundamental education needed for a career in advertising. When it is

considered that the advertising expert must know how merchandise of every kind is produced, must know also every channel and means of distribution and selling, markets and consumers' buying habits and human nature, the many technical features of building and writing advertisements, something of art and composition and typography, and the many mechanical details involved, then it will be seen that no college course can do more than lay a foundation for advertising work. Beyond what may be found in textbooks and reference works, one must acquire a broad knowledge of business. Finance, management, accounting, production, and distribution must be studied in the university of actual experience. The same complexity, the same rapid progression of thought, the same breadth of experience and variety and vision that are needed in other professions, are needed also in the equipment of the advertising expert, plus one special quality for the writer of advertising—the ability to present his story in crystal-clear words that live.

The Economic Problem. Finally comes the question of the economic status of advertising. Is it, as some have maintained, a gigantic waste of money? Has it resulted in overpricing, and in the creation of monopolies? Does the consumer have to pay, in the long run, the yearly charge of a billion and a half dollars? In answer, we may point out that in spite of the millions of dollars spent each year in advertising automobiles, their price was reduced from a \$5,000 average in 1900 to a \$1,400 average at present. Through the power of advertising it has become possible to sell and to manufacture so tremendous a volume of automobiles that a progressively lower price has resulted.

Economists consider advertising a legitimate selling expense, no more wasteful and probably more effective than personal selling. It is plain that through advertising we have become educated to the use of hundreds of new products; we have been emancipated from drudgery by labor-saving devices; our standards of living have been raised; and luxuries have been placed within the reach of the humblest home which no ancient prince could buy with all the wealth of the Orient.

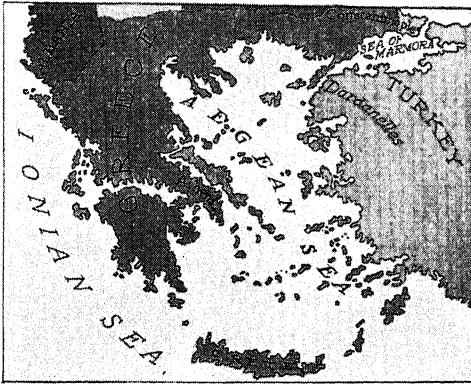
Certainly, when a manufacturer advertises his wares to-day, he has in effect made a pledge of quality and service which must be reflected in his product, or his advertising will prove a waste indeed. Government figures showing the growth of companies manufacturing clothing, food, tooth paste, fountain pens, and other products very heavily advertised, would seem to offer unassailable proof of the economic soundness of advertising.

I.B.

ADVOCATE. See **BARRISTER.**

AEGEAN, *eje'an*, SEA, a body of water which, because of its almost innumerable islands, is also called the Aegean Archipelago.

It is that part of the Mediterranean which lies between Greece and Asia Minor, and is in length about 400 miles and in greatest breadth 175 miles. The profusion of islands gives



LOCATION OF THE AEGEAN SEA

beauty to the sea, but navigation is dangerous, notwithstanding the safe harbors. Of its islands, many of which are of volcanic origin, the most important are Delos, Rhodes, Patmos, Samos, Lesbos, and Lemnos, all of them famous in legend and history. It was of these islands of the Aegean that Byron wrote—

The isles of Greece, the isles of Greece,
Where burning Sappho loved and sung!

* * *

Eternal summer gilds them yet,
But all except their sun is set.

AEGIS, *e' jis*, the shield fashioned by Vulcan, which Jupiter was thought to shake when it thundered, and which Minerva carried as a sign of her authority whenever intrusted with a mission by her father. It is frequently mentioned in the *Odyssey* and the *Iliad* and is described in legends as having the head of the Gorgon for its center.

[See MYTHOLOGY, and the articles on each of the gods named.]

AEGISTHUS, *e jis' thus*. See **ELECTRA**; **CLYTEMNESTRA**; **ORESTES**.

AENEAS, *e ne' as*, one of the most famous heroes of ancient legend, a Trojan warrior who was second only to Hector in the part he played in the Trojan War. Aeneas was the son of Venus and of Anchises, and was chosen to lead a band of followers to a new land in Italy, and there to found a new nation. The story of his wanderings after the fall of Troy is told in Vergil's *Aeneid*.

Related Subjects. The reader is referred in these volumes to the following articles:

Achates Aeneid Carthage Troy

AENEID, *e ne' id*, one of the world's great epics, written by the Roman poet, Vergil. In the article on that author's life the reader

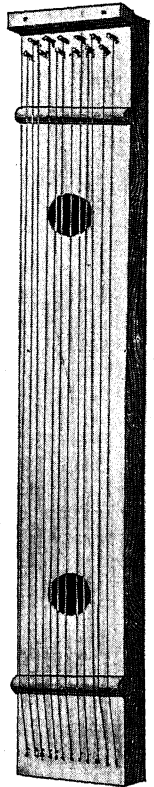
will find a discussion of the literary merits of the poem. It is divided into twelve books, and relates the wanderings and adventures of the Trojan hero, Aeneas. Though Vergil used the Greek epics, the *Odyssey* and *Iliad*, as his models, his purpose in composing this, his masterpiece, was the glorification of Rome and of the line of Julius Caesar. His desire to revive interest in the ancient mythology caused him to introduce gods and goddesses, and these he pictured as taking an active interest in the affairs of mortals. All the misfortune that comes to Aeneas is due to the relentless hatred of Juno, while Venus, mother of the hero, labors to thwart the scheme of the queen of heaven.

The Story of the Poem. The story, briefly told, is as follows: In the sixth year of his wanderings after the fall of Troy, Aeneas, accompanied by his friend Achates, is sailing from Sicily to Italy. In the course of a terrible storm, brought about by Juno, he is shipwrecked upon the African coast. There he receives aid from Dido, queen of Carthage, and to her he relates the story of the fall of Troy, the destruction of the city by fire, his escape to Mount Ida, and his perilous wanderings until he reached Sicily, where his father, Anchises, died. Under the influence of Venus, Dido falls in love with Aeneas, and to him offers her hand in marriage. But the gods have other plans for the hero, and Mercury is sent by Jupiter to command him to continue his journey. As he sails away from Carthage, he looks back at the flames from the funeral pyre of the heart-broken queen, who has committed suicide. When Aeneas finally comes to Italy, he visits the Sibyl of Cumae, who leads him to the lower regions. There he sees his father, and learns from him that he is to be the founder of a glorious race—the race from which Augustus, ruler of Rome at the time the poem was written, was said to have descended.

After he arrives in Latium, his destination, Aeneas enters into a treaty with Latinus, a neighboring king, and is promised the hand of the latter's daughter, Lavinia. Though Juno strives to break the treaty, and brings on a war with other rulers, the Trojans are finally victorious.

Related Subjects. For the account of this war, see **TROY** (The Trojan War). See, also, the following:

Aeneas	Iliad	Odyssey
Dido	Juno	Venus



AEOLIAN
HARP

AEOLIAN, *e o' li an*, **HARP**, named for the Greek god Aeolus (which see), is a stringed instrument which is played upon by the wind. It generally consists of a box of thin, fibrous wood, to which are attached from eight to

fifteen fine catgut strings or wires, stretched on low bridges at each end, and tuned in unison. It is placed in a window or other aperture, and when the wind causes the strings to vibrate, it produces beautiful harmonies of sound, which swell or die away as the breeze varies in strength. See SOUND.

AEOLIANS, *e o' li anz*, one of the four divisions into which the ancient Greeks were divided. They were mostly island-dwellers, inhabiting the islands of the Aegean Sea, though some lived along the coast of Asia Minor. A literary and imaginative people, they seem to have originated the stories which Homer made immortal in the *Iliad*; and their genius reached its highest point in the poet Sappho, about the seventh century B.C. C.W.

Related Subjects. The reader is referred in these volumes to the following articles:

Achaeans	Greece	Ionians
Dorians	Homer	Sappho

AEOLUS, *e' o lus*, the Greek god to whom was assigned the troublesome task of caring for the winds. His boisterous charges were shut up in a cave in the Aeolian Islands, and a noisy, breezy place it was. According to some accounts, he might release them as he wished, but others declared that he could do it only at the command of Neptune. Boreas, the north wind, and Zephyrus, the west wind, were two of his sons (see ODYSSEY). His name was given to the Aeolian harp (which see).

AERIAL, *a ehr' i al*. See RADIO COMMUNICATION.

AERIAL PHOTOGRAPHY. See PHOTOGRAPHY.

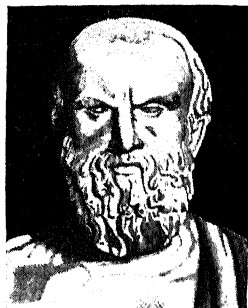
AEROBES, *a'er obz*. See BACTERIA AND BACTERIOLOGY (Kinds).

AEROPLANE. See AIRCRAFT.

AESCHINES, *es' ki neez* (380-314 B.C.), a Greek statesman and orator, born at Athens, who came into prominence during the period when Philip of Macedon was threatening Greece. Though Aeschines was commissioned to rouse the people against Philip, he yielded to that king's arguments in 347 B.C., while he was on a peace mission to Macedon, and thereafter opposed Demosthenes, who persistently urged the Greeks to resist Philip to the end. Twice Demosthenes accused Aeschines of treason, but each time the latter defended himself so eloquently that he was acquitted.

In 330 B.C. the two rivals debated the question of Ctesiphon's guilt in having proposed that the state award a golden crown to Demosthenes. Aeschines maintained that Ctesiphon had violated the law; Demosthenes defended him, and won a complete victory. Aeschines then retired to Rhodes, where he established a school of rhetoric. See DEMOSTHENES; PHILIP II.

AESCHYLUS, *es' ki lus* (525?-456 B.C.), one of the world's great writers of tragedy. Ancient Greece produced three whose tragedies have never been surpassed—Aeschylus, Sophocles, and Euripides; and of these Aeschylus was the first. Unfortunately, of the ninety plays which he is supposed to have written, only seven and a few fragments still exist. These are enough, however, to prove that his own age in honoring him did not rate him too highly, for he treated in a masterly manner his exalted, somber themes.



AESCHYLUS

The details of the life story of Aeschylus are shadowy. Born of a noble family, which traced its descent to the famous Codrus, king of Athens, he entered the army and fought against the Persians for the glory of the city of which he was so proud. Athenian victories increased his patriotic fervor, and many of his plays had as their central theme the exalting of Athens. He won his first prize in the great dramatic competitions in 485 B.C., and twelve other like successes followed. One great disappointment he had in his later years. He himself had fought at Marathon and had won public honors for his bravery, and he entered the contest for a prize offered for the finest elegy on those who fell on that field; but he was defeated, Simonides winning the prize.

Tradition declares that the later life of Aeschylus was spent largely in Sicily, and relates an incredible legend as to the manner of his death. An eagle, it is said, flying far above him, dropped from its talons a tortoise, which struck Aeschylus on the head and killed him. The Greeks seem to have found pleasure in assigning this most unusual death to a man who had made his heroes die in the fashion of the gods. Tragedy owed much to Aeschylus, for it was he who first suggested appropriate costumes and scenery and introduced more than one actor.

His Works. Most of his tragedies were arranged in groups of three, and of those which have been preserved, *Agamemnon*, *Choephori*, and *Eumenides* form such a trilogy. The others are *The Persians*, *The Suppliants*, *Prometheus Bound*, and *The Seven Against Thebes*. Mrs. Browning had an especial admiration for Aeschylus; she wrote a poetical version of *Prometheus Bound*, which is therefore probably better known to English readers than any other of his dramas.

AESCULAPIUS, *es ku la' pi us*, in Greek and Roman mythology, the god of the art of healing, son of Apollo and the nymph Coronis.

When a youth he was placed in care of the centaur Chiron, who taught him what he knew of medicine. Aesculapius, according to the legend, became so versed in his art that he could restore the dead to life. This angered Pluto, the insatiable lord of the underworld, and at his request Jupiter slew the god of medicine with a thunderbolt. Aesculapius is represented in art as bearing a knotted staff; around this was entwined a serpent, which the ancients strangely regarded as the symbol of health.



AESCULAPIUS

[See, in their alphabetical order in these volumes, all the legendary characters named. See, also, HYGEIA.]

AESON, *a' son*, legendary king of Iolcus in Thessaly. See ARGONAUTS.

AESOP'S, *e' sop's*, **FABLES**, a collection of fables which for more than two thousand years have been popular with children and adults alike, the world over. They are for the most part beast fables, wherein animals are given the qualities and the powers of human beings. Children love them chiefly for the story, though the clearly suggested moral by no means detracts from their charm; older people delight in them because they set forth in few words and in pleasingly dramatic form truths and bits of wisdom. So widespread are they that acquaintance with them may safely be taken for granted in almost any company, and allusions to "sour grapes," to "belling the cat," or to "the lion and the mouse" are constantly heard.



AESOP

As the great Spanish painter Velasquez imagined him to look. The painting is in the Prado Gallery, in Madrid.

Aesop, the supposed author of these immortal fables, is a legendary character. Many tales are told of Aesop, a Greek slave, who was far more wise than his masters, and who became a friend of Solon and of Croesus, and it may be that cer-

tain of the popular beast fables did originate with him. But these fables were not written down until long after Aesop is supposed to have lived, and it seems more than likely that they simply grew up, like folk tales, and had no single author.

Related Subjects. Consult the articles **FABLE** and **STORY-TELLING**, for examples of the fables of Aesop.

AETIUS, *a e' shi us*. See VALENTINIAN (III).

AETNA, *et' na*, a variant of Etna (which see).

AFFIDA'VIT, a statement or declaration reduced to writing before an officer who has authority to administer an oath or affirmation. It is sometimes employed when it is not possible for a witness to appear in a court personally to testify; frequently the preliminary testimony in a case is in the form of affidavits, these being preferred rather than that the court's time shall be consumed by the hearing of oral testimony. Penalties for false swearing to facts related in an affidavit are severe. An affidavit differs from a *deposition*; the latter contains evidence reached through examination and cross-examination.

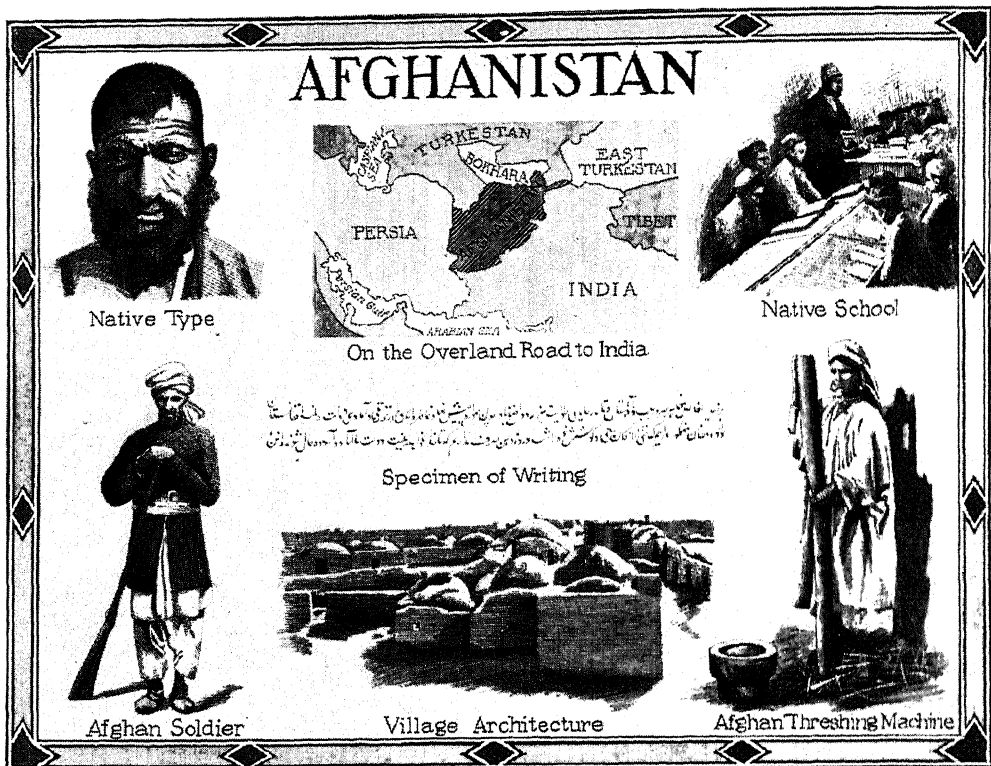
AFFIN'ITY, in chemistry, the force or tendency through which two or more substances unite to form a compound in which the properties of each individual substance are lost; the two light colorless gases, oxygen and hydrogen, for example, unite to form water, and the metal, sodium, and the yellowish-green gas, chlorine, unite to form common salt. It follows that affinity is also the force which holds the elements together if they are in combination. This force, whatever it is, is called affinity, because it is evident that some hidden relationship between substances makes them combine. One ingenious chemist suggested that the particles into which matter is ultimately divided all had minute hooks with which they grasped each other.

In some elements, such as oxygen and chlorine, the force of affinity is strong, and these may be combined with many other elements; others, like nitrogen, seem to have an affinity for only a few elements. Among the metals, sodium, potassium, calcium, and aluminum have strong affinity for such nonmetals as oxygen and chlorine; while gold and platinum have so small a tendency to combine with other elements that the alchemists called them "noble" and even "royal" metals. For the same reason, the gases helium, argon, and neon, which appear to be without affinity for any of the other elements, are called "noble" gases.

With the general acceptance of the electronic theory of atomic structure, which is explained in the article **CHEMISTRY**, chemists are attempting to explain affinity in terms of the movements of electrons. See, in particular, the section on *Chemical Compounds*. T.B.J.

AFFIRMA'TION. See OATH.

AFFRAY'. See RIOT.



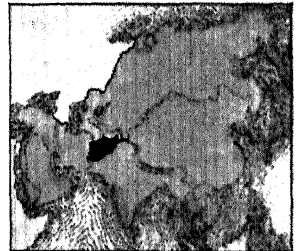
AFGHANISTAN, *af gan' i stan*, a small country in South Central Asia, whose location has shaped its history for centuries. Lying adjacent to India, it has been the western gateway to that rich peninsula and a thoroughfare for many a conqueror. Lying south of Russian Turkestan, it has been a source of concern to Great Britain because it has been the only barrier against the encroachment of the Russians upon the Indian Empire. For some time previous to 1921, the British controlled the foreign relations of Afghanistan, but in November of that year a treaty was concluded by which Great Britain acknowledged the complete independence of the smaller country, and Afghanistan took its place among the nations as a sovereign state. In 1922 the ruling amir, Amanullah Khan, assumed the title of king, but was forced from power in 1929.

Size and People. Though the exact boundaries of the country have not been determined, Afghanistan is known to be about the size of Texas. Estimates of its area range from 245,000 to 270,000 square miles. The exact population, too, is unknown, but is probably between 5,000,000 and 8,000,000. The inhabitants, who are called Afghans without discrimination, by outsiders, are divided into several tribes. Among these, the Duranis are the dominant group; others include the Tajiks, the Ghilzais (of Turkish origin), and the Kaffirs.

The Duranis, who have the best right to the name Afghan, somewhat resemble the Hebrews in appearance, and though of Aryan origin, they claim descent from the Lost Tribes of Israel. The men are large and strong, and as fighters are more than the equal of the native soldiers of India. These Afghans are fanatically devoted to the Mohammedan religion, and call the devotees of other faiths infidels.

Elementary education is free and compulsory throughout Afghanistan, and provision is made for free higher education. King Amanullah was so progressive that he earnestly sought the emancipation of women through the agency of female schools. Yearly, large numbers of students are sent to progressive European countries to be educated. The Pushtu is the prevailing tongue of Southern and Eastern Afghanistan, but Persian is the language of the court and of literature.

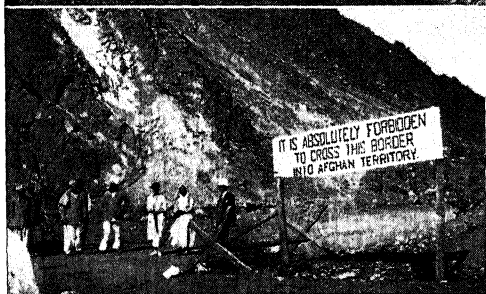
The Cities. Authority is intelligently ex-



The location of Afghanistan in the continent of Asia is shown in black.



Photos: U & U; O R O C



Above: Where Afghanistan and British India meet. Below: a sign at the entrance to Khyber Pass, looking toward the Afghan country. Beyond that point no one may travel without permission. Trespassers would quickly draw the fire of soldiers stationed in the hills.

exercised in the cities, chief among which are the following:

Kabul, *kah'bool*, is the capital and largest city, situated on the Kabul River, about 300 miles northeast of Kandahar. It is an ancient city, divided and subdivided by walls with narrow gates. Carpets and shawls are manufactured. Caravans journeying between Persia and India pass through the city. In it is published the *Court Gazette*, until recently the only newspaper printed in Afghanistan. Here also are located two fine colleges, the Military College and the Arts College. From Kabul, in 1880, Lord Roberts started on his memorable march to Kandahar. It was taken by the British in 1839 and again in 1879. Population, about 180,000.

Herat, *he rah't*, capital of the province of the same name, is a city of political and strategic importance, and long regarded as the "key to India," because of its position on the chief trade route through the country. It is fifty miles south of the Russian frontier and 370 miles west of Kabul. The town itself is unsightly, with crooked, narrow, and dirty streets and few notable buildings. The chief manufactures are sword blades, carpets, shoes, sheepskin caps, and rosewater made from flowers grown in magnificent gardens.

Herat was founded by Alexander the Great, and its history has been one long series of conquests. It came under the rule of Arabs in the seventh century, was captured by Timur in 1381 and by the

Persians in 1510. At times the inhabitants regained their independence, but finally fell under the sway of the Afghans. Population, estimated, 121,000.

Physical Features and Production. The Hindu Kush range and its branches form the dominant feature of the topography. Their highest peaks are over 20,000 feet in altitude, and there are lofty passes affording means of communication from one section to another, but the general elevation of the country is from 2,000 to 4,000 feet. Scores of narrow, unnavigable rivers have cut their way through deep valleys. In a country of such varied elevation, the climate, of course, has a wide range. In the same locality the temperature may rise to 120° F. in the summer, and fall to 15° F. below zero in the winter. There are also extremes of temperature from day to day. On the whole, Afghanistan has a dry and healthful climate.

Owing to the mountainous character of the country and the light rainfall, agriculture is limited to the fertile plains and valleys, and is carried on with the aid of irrigation. Wheat, barley, corn, rice, fruits, and vegetables are important crops, and such plants as the castor bean, the madder, and the asafetida thrive. Fruits, for which Afghanistan is famous, are raised in abundance, and in the dried form are exported in large quantities. Both fresh and

preserved fruits are a staple food of the people, who use the flesh of sheep as the principal meat of their diet. The fat-tailed sheep is native to this country, and the grease of its tail is used as butter. The wool and skins are made into wearing apparel, the surplus being exported.

More famous than the fruits of Afghanistan are the gorgeous silks, embroideries, and carpets which the Afghans weave and trade to the Hindus of India for cotton goods, tea, and sugar. The nomads living near Herat weave carpets of beautiful design.

Commerce and Communication. The natural barriers to transportation have prevented the building of railroads, but there are several caravan routes leading to India, with which there is an active trans-frontier trade. Merchandise is carried chiefly by ponies and camels. Commerce with India was aided by the completion, in 1925, of a railroad from Jamrud (India) to the head of Khyber Pass, the gorge which carries the route to Kabul. There is now telephone service in Kabul and other large towns, and the capital has wireless connection with India and Russia, and telegraphic communication with Peshawar, India. In 1929 King Amanullah endeavored to compel the people to adopt Western customs. Fortified by Mohammedan tradition, they rebelled, and under leadership of Habibullah, a water carrier, they drove the king from the throne. Habibullah succeeded him. Within six months this ignorant "water boy," thirty years old, was driven from power, and was executed. Nadir Khan, a former officer under Amanullah, brought about the coup, and became king, in 1930.

Government. Afghanistan, since 1922, is a constitutional monarchy. There are legislative and state assemblies, and separate departments of war, foreign affairs, education, commerce, justice, etc., each in charge of a minister. The provinces are under governors.

History. Alexander the Great was probably the first invader of Afghanistan. He founded the present city of Herat, called then Alexandria Arion, and began the building of Kandahar.

Genghis Khan conquered the country in the twelfth century, and at his death it fell to one of his four sons. Britain's entry into the affairs of the nation was in 1839, when a force entered the capital and placed a native prince of its choice upon the throne.

The native people conspired against the foreign authority, and in 1841 murdered many Englishmen in the capital city. The effort to maintain British supremacy was temporarily abandoned, and in the retreat of the forces to India thousands were slain. Through Khyber Pass, the only entrance to the country from the south, another army was sent the next year, and Kabul again fell under British authority.

At this point Russian influence from the north began to be felt, and Russian armies, approaching from Turkestan, presented a situation which nearly led to war between Russia and England, but a settlement of boundaries of spheres of influence averted a conflict. The rulers of Afghanistan strictly observed the treaties which England forced from them, until in 1921 the complete independence of the Afghan state was acknowledged by Great Britain.

Related Subjects. The reader is referred in these volumes to the following articles:

Genghis Khan

Hindu Kush

Khyber Pass



FORMER KING AMANULLAH



AFRICA, the second largest land mass on the globe, the "Dark Continent" of a generation ago, and still, despite exploration and enterprise, shut off from civilization throughout many of its regions. There is now no part of the continent out of contact with white men, but throughout vast areas the influence of the latter has had but slight effect. In reality, Africa is a great peninsula of Europe-Asia, though through all historic

times there has been no land connection with Europe; that with Asia is limited to the Isthmus of Suez, and it is traversed by a waterway, the Suez Canal. Where the Strait of Gibraltar is narrowest, the coast of Africa is only nine miles from that of Europe.

The area of Africa, approximately 11,500,000 square miles, is greater than that of any other continent except Asia, surpassing that of North America by over 3,000,000 square

miles. Its length is 4,960 miles, its greatest breadth is about 4,500; hence a rectangle drawn to include it would be almost a square. At very near its central north and south point, the equator crosses it, and thus it stretches from about the latitude of Richmond, Va., to that of Buenos Aires. The Pacific Ocean nowhere touches this vast continent, which has the Atlantic Ocean on the west and south, the Indian Ocean and Red Sea on the east, and the Mediterranean on the north.

Form and Coast Line. In general, Africa resembles North and South America in its shape—that is, it is roughly triangular, with the widest part to the north; but it does not taper sharply toward the south, as do the American land masses. Its coast line is very regular, with few of the deep gulfs and bays and sharply projecting peninsulas which mark the northern coast of North America, for example, or that of Norway. There are two interesting facts connected with this: Africa has the shortest coast line in proportion to its area of any continent, and it has few good harbors. The first of these facts is strikingly apparent if we consider that this second greatest of the continents has a coast line of only 19,000 miles, while little Norway, if all its indentations are followed, has a coast line of 12,000 miles. Just what effect the absence of harbors has thus far had on the history of Africa it is impossible to say, but undoubtedly, taken in connection with the difficulty of navigating the rivers, it helped largely to keep the interior of the continent for centuries an unknown land.

Nor has Africa at any point the fringe of islands, large or small, which make picturesque the coast of Chile, of Canada, or of Norway, for examples. One island, Madagascar, the fifth largest in the world, lies 250 miles to the east, but the channel which separates the two is so deep that Madagascar seems less closely connected with Africa than Africa does with Asia and Europe. The other islands, for the most part small and of no great importance to Africa, include the Madeira, Canary, and Cape Verde, in the Atlantic, and Reunion, Mauritius, and Zanzibar in the Indian Ocean.

Surface. It is not only in its coast line that Africa lacks variety; a sameness is to be observed also in its surface structure. This does not mean that it is actually monotonous; but there are no mountain systems like the Rockies and Andes in the two Americas, no wide fertile valleys like that of the Mississippi, no region like that of the Alps, where for thousands of square miles mountain is piled on mountain. In general, Africa is a great table-land or plateau, which in some places runs abruptly to the coast but in others leaves a narrow coastal plain. The average height

of this plateau is 2,130 feet, but while in the southern part of the continent land less than 2,000 feet above the sea is unusual, except in the coastal plains, in the northern part land above that elevation is the exception. The line dividing the higher southern plateau regions from the lower at the north extends roughly from the southern end of the Red Sea to the head of the Gulf of Guinea.

North Africa. The highest mountain range, the Atlas, is found in the northwestern part of Africa. This runs parallel to the Mediterranean coast and attains in its western half a considerable height, some of its peaks exceeding 14,000 feet. The coastward slope of these mountains is gentle, and plains occur at their base, but to the south they drop abruptly, and at one point are bordered by a depression which is below sea level. The other outstanding highlands of North Africa are three: a north-and-south elevation along the shore of the Red Sea; a long ridge which runs from northwest to southeast across the center of the regions; and a comparatively low range at the head of the Gulf of Guinea. The one outstanding feature of the continent, more or less familiar to every child, is the great Sahara Desert, stretching from coast to coast, except for a narrow strip along the Nile River. Thus far it has been almost an insuperable barrier between north and south, but man's ingenuity is now planting highways across it.

South Africa. Though South Africa has not the largest mountain range, it has many high peaks, for Kenia and Kilimanjaro rise to heights of 17,000 and 19,000 feet. These are close to the equator and are old volcanic craters, but the Ruwenzori, which is a range rather than a peak and rises to a height of 16,800 feet, is of the folded variety of mountains—that is, it is due to a lifting and bending of the earth's crust, and not to a heaping up of lava.

The most important highland of the whole continent is that of Abyssinia (now Ethiopia), which begins in the country from which it took its name and extends far to the south until it ends in the Drakensberg Mountains. In this great plateau there occur sharp furrows, or rift-valley cracks left by some disturbance of the earth's surface in past geologic ages; and in these basins are found the great lakes.

Rivers and Lakes. Africa has five large rivers—in the order of their length, the Nile, the Congo, the Niger, the Zambezi, and the Orange; and of these the Congo is second only to the Amazon among the rivers of the world in the volume of water it carries to the sea. But these, except the first named, have had no such effect on the history and commerce of the countries they traverse as have the Mississippi and the Saint Lawrence; for in common with other African rivers, they present one

difficulty as waterways. Rising in the high plateaus, they drop down successive terraces toward the coast in a series of waterfalls which make for picturesqueness and beauty, but not for navigation. As the development of the continent goes on, however, under the guidance of Europeans, this difficulty is being surmounted in many places by the building of railroads about the falls.

The Zambezi is the only one of the great river systems which discharges its waters into the Indian Ocean, for the drainage of Africa, like that of most of the other continents, is into the Atlantic. However, about one-third of the vast territory sends no waters into the sea, and in this proportion of its interior drainage Africa surpasses all other continents except Asia. Much of this inward-flowing water finds its way into Lake Chad—a large, shallow body of water which remains fresh despite the fact that, except in times of flood, it has no outlet.

This second largest of the continents, which boasts next to the largest river in the world, also possesses the largest fresh-water lake but one, for Victoria Nyanza is surpassed in size only by Lake Superior. It lies in the eastern part of the continent, and its northern boundary touches the equator. To the west of this great lake stretches a chain of smaller bodies of water, which occupy one of the rift valleys and lie at a greater height above sea level than most other lakes of the world. These are Tanganyika, the longest lake in the world, and one of the deepest; Kivu, Lake Edward, and Albert Nyanza. Other noteworthy African lakes are Tsana, in Ethiopia, Mweru, and Bangweolo, the last-named of which is little more than a morass except in the rainy season.

Climate. North America stretches from well within the tropics to the Arctic Circle, and in consequence has a climate which runs through all degrees from torrid to frigid. Africa, on the other hand, lies almost wholly within the tropics, and has therefore a much more even temperature. And that temperature is almost uniformly high, for cooling sea breezes are shut out by the steep edges of the plateaus which everywhere border the coast. The variation in temperature throughout the year is not more than 20° , while North America has in many places a range more than four times as great. The extreme southern part of the continent is

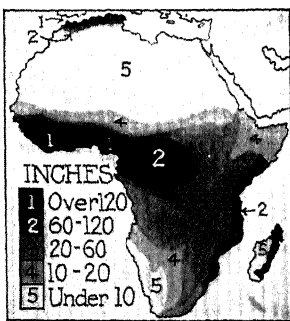
the only region which has not a tropical climate, though there are places farther north where unusual elevation assures pleasant climatic conditions.

Africa is deficient in rainfall except in the regions bordering the equator, where there are two seasons of especially heavy rainfall, though there is considerable rain every month in the year. Northward and southward from this belt it diminishes rapidly, and over portions of the Sahara no rain ever falls. In the south, too, there is a stretch of desert land, the Kalahari, but this is not so dry as the Sahara, having enough moisture to make it a profitable grazing country. To the north of the Sahara and south of the Kalahari, there is one rainy season during the year, and agriculture may be successfully practiced. The surface structure of the continent has as much to do with its lack of rainfall as with its temperature, for moisture-bearing winds do not reach the interior. Indeed, so dry and hot are the winds which blow over parts of the continent that they absorb the moisture from the lands over which they pass and make them yet more arid.

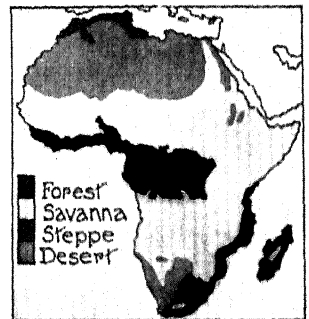
The highest parts of the plateaus of Africa, as well as the more temperate northern and southern portions, are healthful for Europeans and for the natives alike; but the damp equatorial regions abound in fevers and are among the most unhealthful places in the world. Even the natives in these parts are short-lived, for the fevers attack them as well as the newcomers. Improved sanitation has been introduced wherever white people have settled, with resulting lower death rate.

Vegetable Life. The above account of the climate and rainfall explains the vegetation. North of the Atlas Mountains conditions are much like those of Southern Europe, and the oak, olive, semi-tropical fruits, and grains flourish. In Algeria and Tunisia, wheat is successfully raised, and Morocco has a region which offers like possibilities. In the time of the Roman occupation, before the Christian Era, this northern belt was the granary of the world.

South of the Atlas, the slope is abrupt to the Sahara Desert, where the sandy, salty soil affords life to little except a few thorny shrubs. In the oases, however, where springs come to the surface, there is a pleasing contrast, for

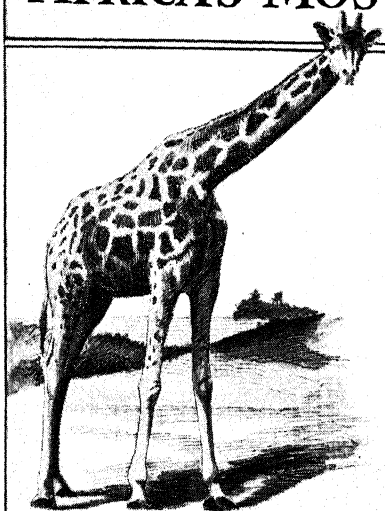


RAINFALL CHART



AFRICAN PHYSICAL MAP
Showing vegetation zones.

AFRICA'S MOST NOTABLE ANIMALS



Giraffe



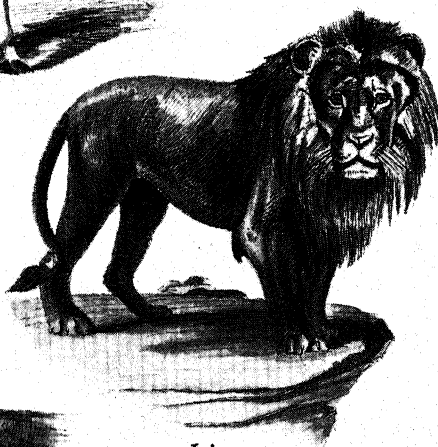
Head of Zebra



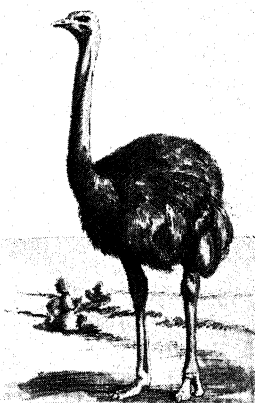
Hippopotamus



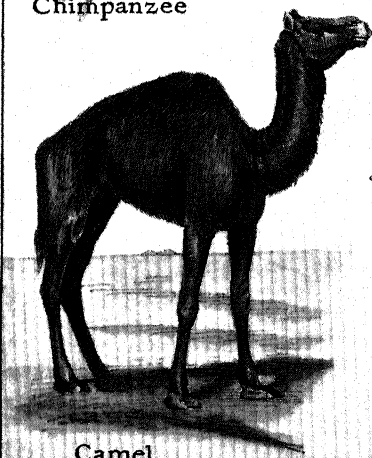
Chimpanzee



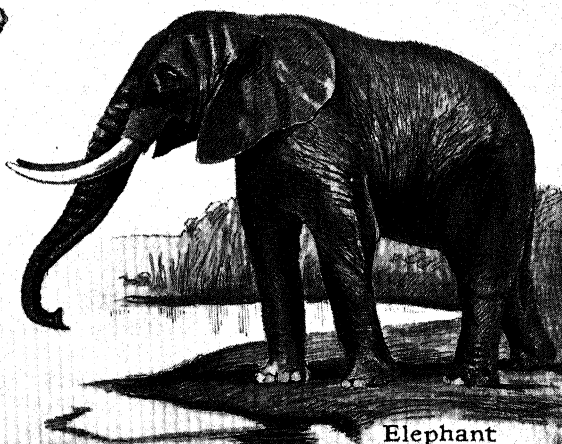
Lion



Ostrich



Camel



Elephant

grass, date palms, and grain clothe the surface with green (see OASIS). To the south of the Sahara, as well as in the more southerly parts of the continent, where there is one rainy season a year, lie the great savannas, or prairies, where grass grows luxuriantly and the baobab tree flourishes. It is on these savannas that the farms, whether for cattle and sheep or for ostriches, have been established. The temperate region of the south has many trees and flowers which do not grow elsewhere, for the Sahara Desert, stretching from sea to sea, is a barrier that cannot be crossed by plant forms.

Throughout most of the equatorial region, where rainfall is plentiful, there are dense tropical forests. No other forests except those of the Amazon equal in size, in density, and in variety of trees those which extend almost across Central Africa. The vines and underbrush are so luxuriant that throughout much of this vast extent the sun seldom penetrates to the ground. No one can even begin to estimate the wealth in timber, vegetable oils, and other plant products hidden in these forests of giant trees.

Animal Life. As the climate and rainfall govern the vegetation, so the latter determines the distribution of animal life. It may be said in general, however, that Africa is the home of the largest members of the animal kingdom, some of which live there exclusively; and that, for the most part, all regions south of the Sahara, whatever their latitude, have about the same forms of animal life if their plant life is similar.

Northern Africa has about the same animals as Southern Europe, but south of the Sahara distinctive species appear. Over the grassy savannas, which with their scattered forest areas afford shelter for such animals as feed upon the grass of the prairies, range the buffalo, the rhinoceros, the gnu, the zebra, almost roo kinds of antelope, and the giraffe, which is peculiar to Africa. Where these grass-eating animals are to be found, there also are the flesh-eating animals which prey upon them—the lion, the panther, the leopard, the hyena, and the jackal. The bear and the wolf are found nowhere in Africa. Formerly, elephants were very common in all parts of the continent, but they have been so persistently hunted for the ivory of their tusks that there is danger of their complete extinction, and the latter is true of other wild animals. In the swamp and river regions are to be found crocodiles in large numbers, as well as the hippopotami, which live nowhere but in Africa.

It might seem that the great forests near the equator would furnish just the sort of homes that animals might desire, but one of the outstanding features of the continent is the scarcity of the animal life in these regions.

Even the largest animals find the plant growth too dense, so these great tracts are given almost exclusively to reptiles, insects, and the great monkeys, the chimpanzee and the gorilla, which are peculiar to Africa. Numerous other species of monkeys live in the less dense forests



Photo: U & U

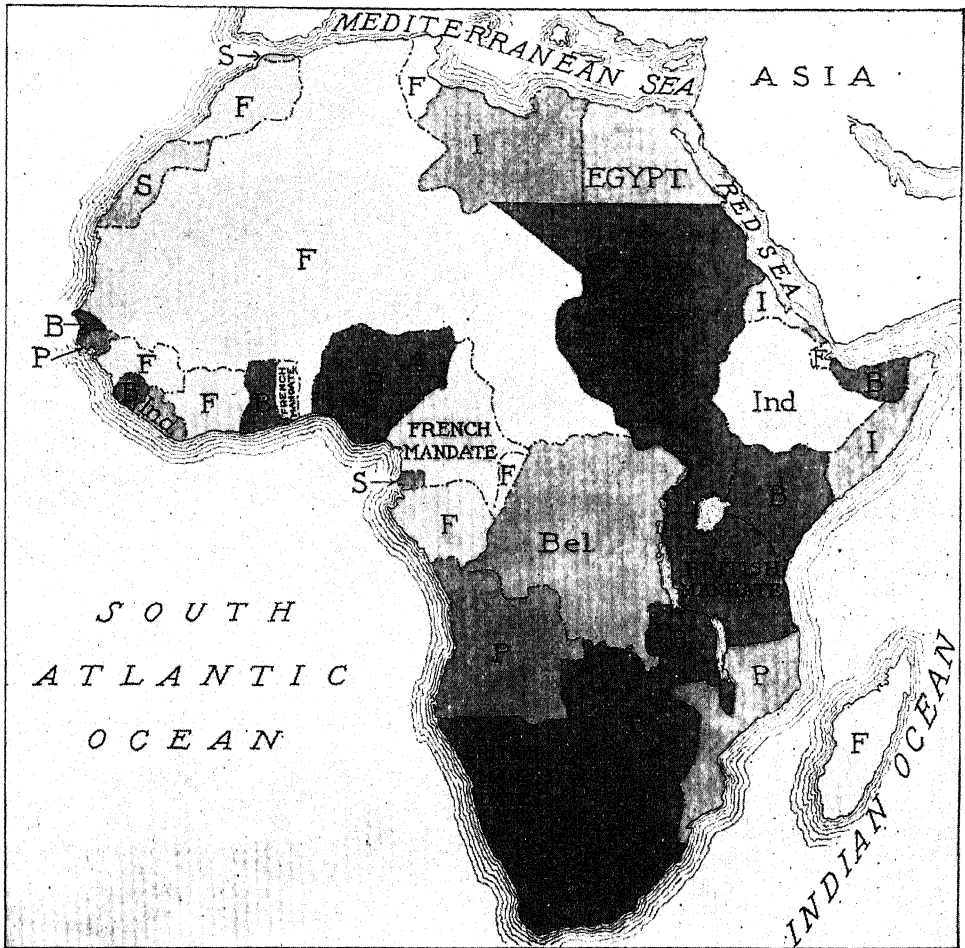
NATIVE BARBER SHOP IN WEST AFRICA

The barber appears happier than the customer.

farther south, and on the southern savannas dwells the ostrich, which is to be found native nowhere outside of Africa. The reptile and bird life is abundant, many of the birds being characterized by their brilliant feathers. Song birds are not as common as they are in North America, and most of the gorgeous birds have more attractive plumage than voices.

With the exception of the great journeys of exploration, discussed below under *History*, the most famous of African expeditions was that undertaken by Theodore Roosevelt in 1909-1910. Purely scientific in its object, it sent back to the Smithsonian Institution (which see) a larger number of big game specimens than were ever before secured by any single expedition.

More destructive by far than the great animals of Africa, and far more important as a cause of the backwardness of the continent, are the insects, which swarm everywhere. The white ants ruin frame buildings by hollowing out the timbers; the locusts make farmers poor by devouring the crops; the tsetse fly has a bite which is fatal to dogs, horses, and cattle, and which in some instances is believed to transmit sleeping sickness (see **TSETSE FLY; SLEEPING SICKNESS**). But perhaps the greatest pest of all is the mosquito, which spreads by its bite the tropical fever, and so makes



OWNERSHIP OF AFRICA

B stands for British possessions, F for French, P for Portuguese, S for Spanish, I for Italian, Bel for Belgian. After the World War began, Great Britain declared a protectorate over Egypt and the Sudan. The South Africans conquered German Southwest Africa for Britain. The French and British conquered Togoland and Kamerun. The British in 1916 won German East Africa. Territories under League of Nations mandate are shown. Egypt is now nominally independent.

large parts of the continent uninhabitable.

Mineral Wealth. When the mineral resources of Africa are referred to, diamonds and gold are at once brought to mind, and these are indeed the most valuable. The center of production for both lies within the Union of South Africa, the Transvaal now exceeding the United States in the production of gold, and Kimberley, which exports nine-tenths of the world's supply of diamonds.

South Africa also bids fair to produce a large amount of coal when its resources are further developed; great deposits of tin have been discovered in Nigeria, and the Belgian Congo has opened copper mines which seem practically inexhaustible. Thus it may be predicted that when the "Dark Continent" is

more thoroughly known, it will prove to be one of the world's richest treasure houses of minerals.

The People. Broadly speaking, Africa's population, estimated at about 140,000,000, is made up of two races, the white and the black. It is not, therefore, strictly correct to use the term *African* as meaning the same as *negro*, as is so often done. But to eyes accustomed to looking upon the Caucasians of Europe and North America, the *white* men of Africa would not look white, for they have been burned by century after century of tropic sun. Indeed, the division between the two races is made according to the shape of head and features, and language, rather than according to color. North and east of the Sahara the white race is

to be found; south of that barrier, the black; and, as is natural, on the borderland between the two is a mixed race. Then, in the southern reaches of the continent the whites dominate, though greatly in the minority.

Just south of the white man's country in the north, in a broad strip called the Sudan, are the most northerly of the true negroes, and the blackest; it was in this region that the slave-dealers carried on their trade. Southward, and beginning just north of the equator, is the Bantu family, a collection of tribes of light-colored negroes who are connected rather by a common language than by any physical peculiarities. These Bantus occupy all the remaining part of Africa, except the southwestern corner, where live the Hottentots and Bushmen. Tribes of very small, as well as very large, people occur at intervals in Africa, and it is believed that the sight of these gave rise to many of the popular tales of dwarfs and of giants. Of Europeans and Americans there are not many more than are needed to control the numerous enterprises, private and governmental, which have been opened up in various parts of the continent.

Religiously, the continent is still "Darkest Africa," for almost sixty per cent of the people still hold to the old heathen superstitions which make right, and even necessary, demon-worship, fetishism (see FETISH), and barbaric cruelty. Over a third of the whole population are Mohammedans, and the remaining five or six per cent are Christians of one branch or another.

Division into Countries. Africa contains two independent countries, Ethiopia and Liberia, but together they possess less than

five per cent of its area. Egypt, also, is nominally independent, but Great Britain maintains a force to protect its canal interests. Except for a neutral zone of 140 square miles at

Tangier, all the rest of the continent is divided among seven European nations as follows:

Belgium. Congo, formerly the Congo Free State; area, 909,654 square miles.

France. Algeria, Congo, Madagascar, Mayotte, Comoro Islands, Somali protectorate, Senegal, Guinea, Ivory Coast, Dahomey, Upper Senegal and Niger, Niger territory, Mauritania, Tunisia protectorate, Morocco protectorate, French West Africa, French Equatorial Africa; area, between 3,500,000 and 4,000,000 square miles.

Great Britain. Kenya Colony and protectorate, Uganda protectorate, Zanzibar protectorate, Nyassaland protectorate, Tanganyika Territory (formerly German East Africa), Southwest Africa protectorate (formerly German Southwest Africa), Basutoland, Bechuanaland protectorate, Swaziland, Union of South Africa, Nigeria colony and protectorate, Gambia colony and protectorate, Gold Coast colony and protectorate, Ashanti, Sierra Leone colony, Anglo-Egyptian Sudan; area, over 4,000,000 square miles.

Italy. Eritrea, Somaliland colony and protectorate, Libia (Tripoli); area, about 600,000 square miles; population, about 1,400,000.

Portugal. Cape Verde Islands, Guinea, Saint Thomas and Principe, Angola, Mozambique; area, 793,980 square miles.

Spain. Canary Islands, Rio de Oro and Adrar, Guinea, Fernando Po, Morocco protectorate; area, about 100,000 square miles.

Note: Until deprived of its colonial possessions during the World War, Germany had extensive holdings in Africa. It owned, until 1916, Cameroon, German East Africa, German Southwest Africa, and Togoland; area, over 931,000 square miles.



Photo: O R O C

IN UNUSUAL COMPANY

The little white girl is watching African children prepare native bread.

History of Africa

The story of Africa is one of contrasts. At the dawn of history the continent was the home of the world's foremost civilization, that of Egypt. Later, the empire of Carthage rivaled Rome, until it was overthrown and utterly destroyed in the last of the Punic Wars (which see). Under the sway of Rome, Africa's Mediterranean coast was still a vital section of the civilized world. Alexandria became a seat of

learning, and there Ptolemy worked out his systems of astronomy and geography; Cyrene, farther west, was a city of prosperous traders, from which came that Simon to whom was given the burden of the Cross on the road to Golgotha; the land of Carthage gave birth to Saint Augustine, who made it a stronghold of active Christendom. But after the fall of Rome, Africa's Mediterranean region sank into a



Photos: Wide World; U & U

Women of Native Tribes. A native of Tanganyika Territory; gigantic leg bracelets worn by women who accompanied their men on a lion hunt in Central Africa; Bantu women in a British East African village, a few degrees south of the equator.

barbarism nearly as gross as that of the unknown regions south of it. The Vandals poured in from the west, then the Arab Mohammedans from the east, and when the blight of their barbarism settled upon the land, the period of Africa's glory was past.

During the Middle Ages, Europe knew little of its southern neighbor, though Spain and Sicily were partly under the domination of the Mohammedans, and the Crusaders once invaded Egypt. In the fifteenth century, Portuguese explorers sailed south along the Atlantic coast, and in 1488 the great navigator, Bartholomew Dias (which see), rounded the Cape of Good Hope. Neither these voyages nor that of Vasco da Gama, who reached India by this route ten years later, excited attention in other countries, but the Portuguese quietly founded several of the colonies which they hold to this day. A century after the discovery of America, fortunes began to be made in the slave trade; about the same time the discoveries of gold became known, and adventurers from Holland, France, England, and other countries became active. In 1652 the Dutch settled Cape Town, though merely as a halfway port on the road to the Indies. That city, lying at the southern tip of the continent, is now one of the fairest gems in the crown of Britain's African possessions.

The Explorers. Toward the end of the period of Europe's great wars of the eighteenth century, a lively interest in Africa was awakened, and the period of great explorations began. In 1770-1772 James Bruce traveled to Abyssinia, the little known Christian spot in the sea of Mohammedanism. In 1797 Mungo Park made known the Niger country, and after him came several less known but no less important explorers. In 1840 David Livingstone began his missionary journeys, in the course of which he crossed Africa from ocean to ocean, discovered Victoria Falls, and explored the Zambezi region. In 1869, when Livingstone was thought to be lost, a Welsh-American, Henry M. Stanley, was sent by the *New York Herald* and the *London Telegraph* to find him; this explorer's great contribution to the world's knowledge was the course of the Congo. See STANLEY, HENRY M.; LIVINGSTONE, DAVID.

The Partition of Africa. At the time of Stanley's expedition, only small portions of the "Dark Continent" were under the flags of Europe. At the south the British had been in possession since 1806, and the Boers had trekked to their Orange River Colony and the Transvaal, farther inland. France had taken Algiers in 1830 and put an end to Mediterranean piracy (see BARBARY STATES), and the

Portuguese, French, and English had small settlements on the west coast. Two influences now acted to stimulate European activity in Africa—the dream of King Leopold II of Belgium to found a vast African empire, and the spurring of French and German ambitions by the Franco-German War of 1870, which ended disastrously to the French.

King Leopold chose the Congo as the scene of his efforts, and in 1876 organized the African International Association, the avowed purpose of which was the systematic exploration of equatorial Africa. Stanley was sent back



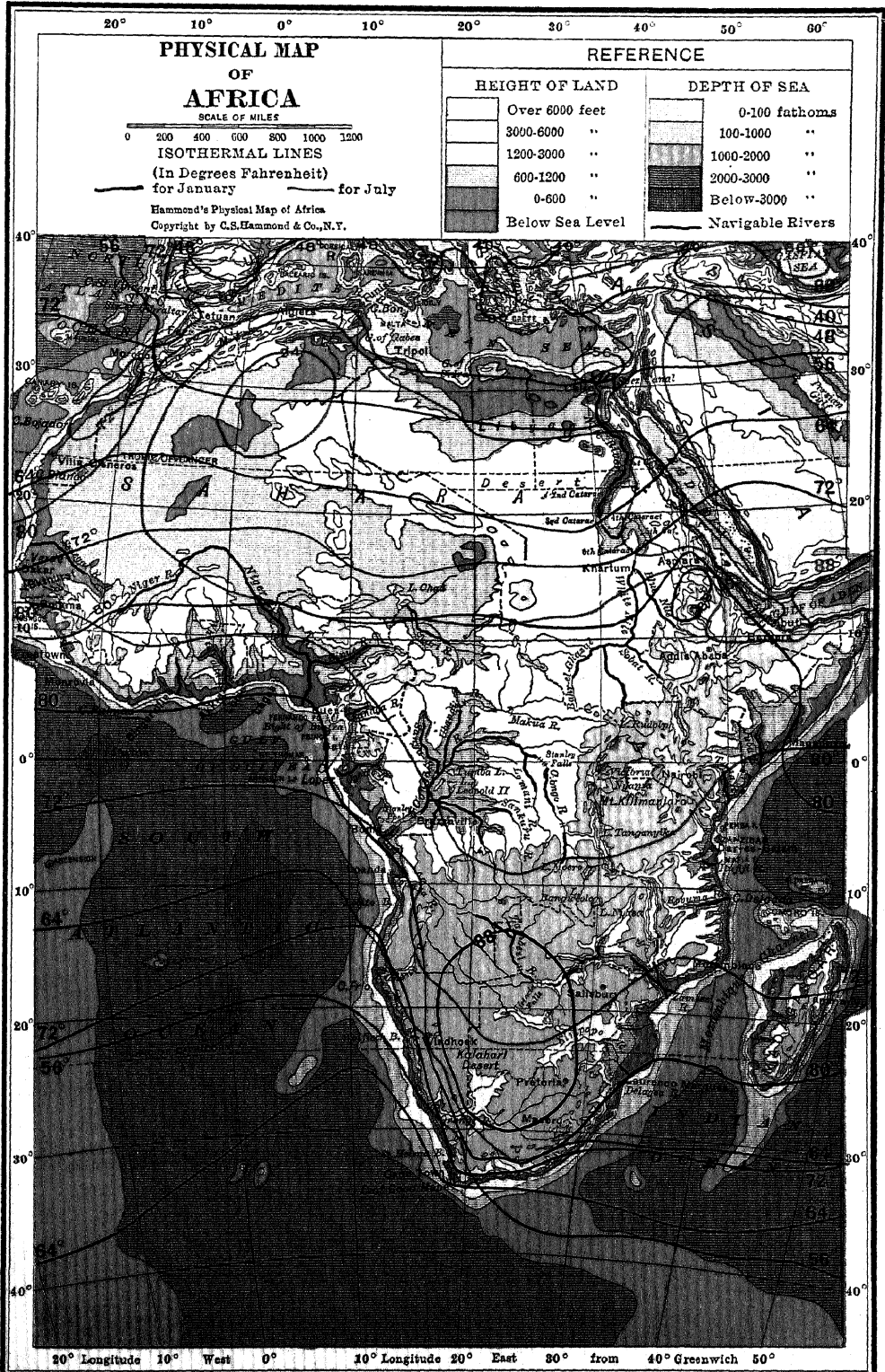
Photos: ORO C

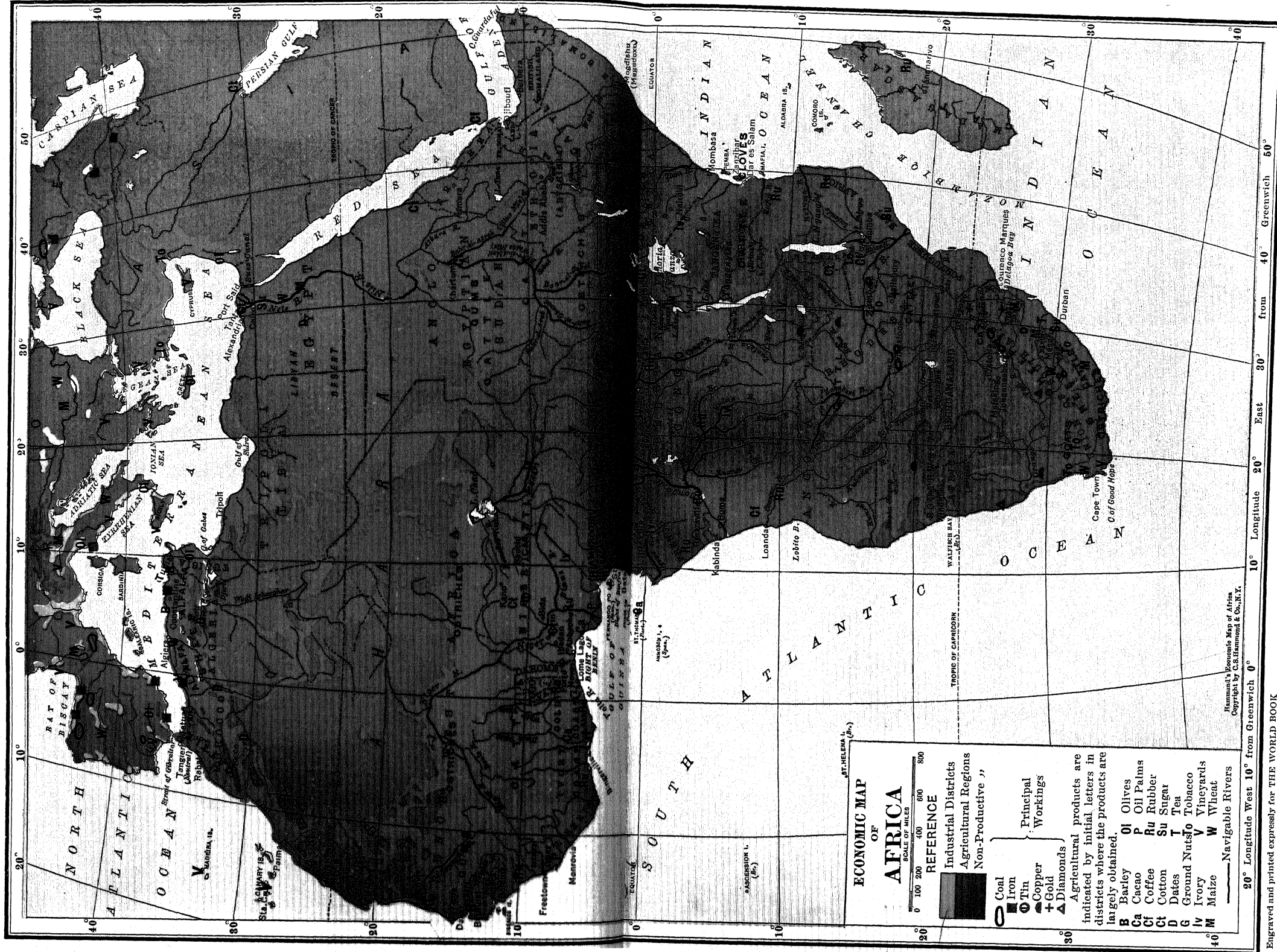
HOME LIFE

In the interior, life is still largely untouched by European ideals. Yet the native who stays at home knows that he will be sneered at by the one who has migrated to the town and adapted himself to the white man's standard. Below: Serowe, one of the largest native towns in South Africa; population, 30,000. It is the chief settlement of the Bamangwato tribe.

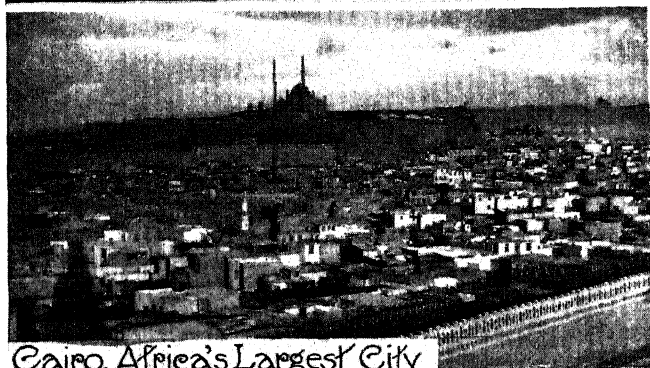
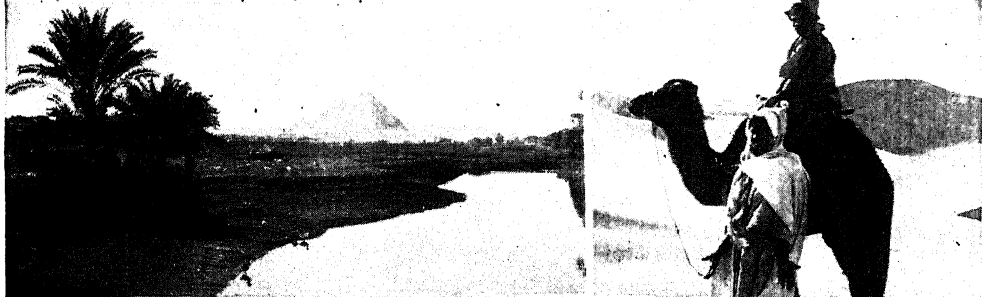
to Africa to carry out the association's plans. But the international character of the undertaking was largely a myth; French and Portuguese agents were also active in the Congo, aiming to forestall the Belgians wherever possible. King Leopold determined to secure definite international acknowledgment of his company. The United States and Germany recognized its flag in 1884, and the next year joined twelve nations of Europe in a treaty which created and neutralized the Congo Free State. In 1908 the Congo was formally declared a Belgian colony, and Leopold's dream became a reality.

The efforts of other nations may be briefly outlined; their relative success is best shown by the map. France's aim has been to link its possessions on the different coasts in a massive inland empire. England, inspired by Cecil





The Everlasting Pyramids



Cairo, Africa's Largest City

Prayer in the Desert

THREE SCENES IN EGYPT

Rhodes, has worked for continuous possessions from Cape-to-Cairo, through the length of the continent from north to south. Germany was deprived of all its African possessions by the treaty which ended the World War (1919), and Great Britain profited greatly by being given mandates by the League of Nations to govern them. Portugal has expanded its already existing colonies. Italy has fought for influence over Abyssinia (now Ethiopia), and recently has raised its flag in Tripoli, now called Libia. Spain has maintained its few small territories and has attempted expansion at its own doorway, in Morocco, where it has but recently subdued the Riff, with the assistance of the French. For the stories of these varied activities, the reader may refer to the articles on the political divisions named in the Related Subjects.

Related Subjects. The following topical index of articles in these volumes relating to Africa will make possible a systematic study of the continent:

CITIES AND TOWNS

The cities and towns listed below are described in these volumes under their own titles. Others are treated in the articles on the political divisions to which they belong.

Alexandria
Bloemfontein
Cairo
Cape Town
Carthage
Durban

Johannesburg
Kimberley
Port Elizabeth
Pretoria
Timbuktu
Utica

COAST WATERS AND CAPES

Atlantic Ocean	Mediterranean Sea
Delagoa Bay	Mozambique Channel
Good Hope, Cape of	(under Mozambique)
Indian Ocean	Red Sea

LAKES

Albert Nyanza	Nyassa
Edward	Tanganyika
Chad	Victoria Nyanza

MOUNTAINS

Atlas	Kilimanjaro
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PEOPLES

Bantu	Kaffirs
Berbers	Mandingo
Boer	Matabele
Bushmen	Moors
Copts	Negro Race
Hottentots	Riff, The

POLITICAL DIVISIONS

Algeria	French Guinea
Anglo-Egyptian Sudan	French Somaliland
Angola	French Sudan
Ashanti	Gold Coast
Barbary States	Guinea
Basutoland	Ivory Coast
Bechuanaland	Kenya Colony
Belgian Congo	Liberia
Cameroon	Libia
Dahomey	Mashonaland
Darfur	Morocco
Egypt	Mozambique
Eritrea	Nigeria
Ethiopia	Nubia
French Equatorial Africa	Numidia

(Continued on page 84.)

OUTLINE AND QUESTIONS ON AFRICA

Outline

I. Position

- (1) Latitude— $37^{\circ} 25'$ north to $34^{\circ} 50'$ south
- (2) Longitude— $51^{\circ} 21'$ east to $17^{\circ} 30'$ west

II. Size

- (1) Length, 4,960 miles
- (2) Breadth, 4,500 miles
- (3) Area, 11,500,000 square miles
- (4) Rank, second, only Asia surpassing it

III. Shape and Coast Line

- (1) Roughly triangular, with greatest width in north
- (2) Regular coast line
- (3) Few good harbors
- (4) Few islands
- (5) Coast waters

IV. Surface

- (1) General
 - (a) Lacks variety
 - (b) Great tableland with average height 2,130 feet
- (2) Specific
 - (a) Northern highlands
 - (b) Southern peaks and Ruwenzori
 - (c) Plateau of Abyssinia

V. Drainage

- (1) Five great rivers
- (2) Lakes

VI. Climate

- (1) Even temperature
- (2) General deficiency in rainfall
- (3) Deserts
- (4) Winds

VII. Vegetation

- (1) Northern vegetation like that of Europe
- (2) Desert conditions
- (3) Savannas
- (4) Tropical forest

VIII. Animal Life

- (1) Largest members of animal kingdom
- (2) Many forms found only in Africa
- (3) Grass-eating animals
- (4) Flesh-eaters
- (5) Reptiles
- (6) Birds
- (7) Insects

IX. Mineral Resources

- (1) Diamonds
- (2) Gold
- (3) Coal
- (4) Copper

X. Inhabitants

- (1) White
- (2) Black

XI. Political Divisions

- (1) Independent countries
- (2) Dependencies

XII. History

- (1) Ancient
- (2) Early modern discoveries
- (3) Modern exploration
- (4) Discovery of mineral wealth
- (5) Recent development
- (6) Independent countries
- (7) Mandated Territories

Questions

Why are children in school usually asked to draw Africa before North America, Asia, or Europe?

Why is not all of Egypt a desert like the Sahara?

How many miles higher is the loftiest point in Africa than the lowest?

Why should Africa not have been as carefully explored and as thickly settled as North America?

What is an oasis? How is one formed in the midst of desert dryness?

If compelled to live in Africa, what part of the continent would you choose?

Why are not the great rivers of Africa of more value for navigation?

What is a simoom?

What effect do the mountains of Africa have on the temperature? On the rainfall? On the rivers?

What are the two great divisions of the inhabitants of Africa?

How did Stanley's purpose in going to Africa differ from Livingstone's?

Is Africa chiefly an independent continent, or one governed from without?

OUTLINE AND QUESTIONS ON AFRICA—Continued

Questions

What part of the western hemisphere is in the same latitude as the Desert of Sahara?

What are the differences in the conditions of the two places?

What difference has the Suez Canal made to commerce?

What is the largest island near Africa? Is its relation with the mainland very close?

Why do not the lions, elephants, and giraffes make their homes in the tropical jungles of Africa?

In what three respects does Africa rank second among the continents?

What proportion of the drainage of Africa finds no outlet to the sea?

What does the Arab of Africa understand by the word *bath*?

What is the chief mountain range of Africa?

Does it contain the highest peak?

For what is Kimberley noted?

What part of the continent produces copper in abundance?

Name three animals that live in Africa and nowhere else in the world.

How does the Congo compare in length with the Mississippi? The Nile with the Amazon?

What part of Africa was known to the world in the time of the Romans?

What explorer first sailed around the Cape of Good Hope?

Who were the Boers?

Compare Victoria Nyanza in size and shape with Lake Superior.

Give some of the main characteristics of the Hottentots.

How does the highest point in Africa compare in altitude with the highest point in South America?

How much larger is Africa than South America? Than Europe?

Would good natural harbors have had any effect on the history of Africa?

What are rift valleys?

Is the southernmost point of Africa as far south as the southernmost point of South America?

How many of the great rivers of Africa discharge into the Atlantic?

What is the longest lake in the world?

How does the southern desert differ from the Sahara?

What is a savanna?

What was the object of Roosevelt's expedition to Africa?

What was the popular name for Africa a generation ago? Is it still appropriate?

About how many oases are there in the Desert of Sahara?

Of what use is the date palm to the people of Africa?

From the map, pick out the largest political division of Africa.

What did David Livingstone accomplish for Africa?

When was the Union of South Africa established?

Compare the Bushmen and the Hottentots as to intelligence.

Do all the Arabs live in Africa?

What harm has the desire for ivory done?

What did the seventeenth-century traders carry off with them when they visited Africa?

How does the African elephant differ from the Asiatic?

What are mandated territories? Are there any in Africa?

What did Stanley accomplish for Africa?

What is the legal name of Abyssinia to-day?

Portuguese Guinea
Rhodesia
Rio de Oro
Senegal
Sierra Leone
Sokoto
Somaliland
Southwest Africa

Sudan
Tanganyika Territory
Togo and Togoland
Tunisia
Uganda
Union of South Africa
Wadai
Zululand



Photo: Wide World

A BADGE OF DISTINCTION

The headdress of this huntsman indicates that he has killed a lion with his spear.

RIVERS

Congo	Orange
Gambia	Senegal
Niger	Zambezi
Nile	

GENERAL TOPICS

Archaeology	Savanna
Pyramids	Sirocco
Sahara	Victoria Falls

CHARACTERISTIC ANIMALS

Antelope	Gorilla
Buffalo	Hippopotamus
Camel	Hyena
Chimpanzee	Leopard
Crocodile	Lion
Elephant	Ostrich
Giraffe	Rhinoceros
Gnu	Zebra

LEADING PRODUCTS

Cotton	Diamond	Gold	Ivory	Rubber
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HISTORY

Cape-to-Cairo Railway	Rhodes, Cecil J.
Gama, Vasco da	Roosevelt, Theodore
Kruger, S. J.	Smuts, Jan C.
Leopold II	South African War
Livingstone, David	Stanley, Henry M.

AFRICAN METHODIST CHURCHES, religious organizations formed exclusively for colored people. They are all branches of the Methodist Episcopal Church.

African Methodist Episcopal Church, the largest branch, was established in Philadelphia in 1816, though there previously existed separate churches of the Methodist denomination for negroes. This Church has 6,900 congregations and over 550,000 members.

Colored Methodist Episcopal Church in America, second in number of churches, but third in membership, was organized in 1870 by authority of the Methodist Episcopal Church South. It has 3,500 churches and 366,000 members.

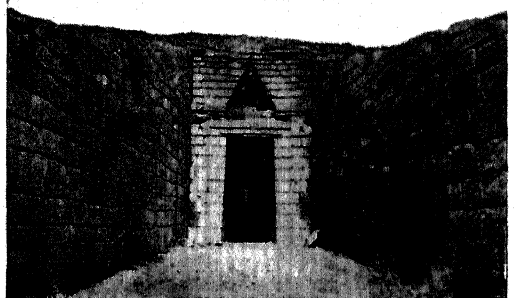
African Methodist Episcopal Zion Church, third in number of churches and second in total membership, was organized in 1820; it now has 2,700 churches and 412,000 members.

Other Churches. Of little importance because none possesses 300 churches and all but one fewer than thirty, are the Colored Methodist Episcopal, Union American Methodist Episcopal (267 churches), African Union Methodist Protestant, Reformed Zion Union Apostolic, African American Methodist Episcopal, and Reformed Methodist Union Episcopal.

The doctrines of the African Methodists are in accord with those of the Methodist Episcopal Church. For further information, see the article **METHODISTS**.

AFRICAN OAK. See **TEAK**.

AGAMEM'NON, one of the outstanding figures in ancient Greek legend, brother of Menelaus, whose wife Helen was the cause of the Trojan War. As king of Mycenae and Argos, and thus the most powerful ruler in Greece, Agamemnon was chosen to command all the Greek forces when the struggle commenced. On his return from the war he was killed by his wife, Clytemnestra, and her lover, Aegisthus.



TOMB OF AGAMEMNON

At Mycenae, Greece.

Related Subjects. The reader is referred in these volumes to the following articles:

Clytemnestra	Menelaus
Helen of Troy	Mycenae
Iliad	Mythology
Iphigenia	Troy

AGAÑA, *ah gahn' yah*, capital of Guam (which see).

AGANIP'PE, in Grecian mythology, a fountain near Mount Helicon, in Boeotia, sacred to the Muses, which had the property of inspiring with poetic fire any person who drank of its water. See **MUSES**; **HELICON**.

AGARIC, *ag' a rik*. See **MUSHROOMS**.

AGASSIZ, *ag' ah se*, the family name of two great naturalists, father and son.

Louis John Rudolph Agassiz (1807-1873) was one of those rare men who combined ability for research in science with the power of inspiring other men. He was the greatest authority of his day on marine zoology, and he discovered many new facts in geology and animal life, but his fame is greater for the imagination and the enthusiasm which he communicated to his pupils. His science was sometimes at fault; his humanity never. At the age of 22 he wrote to his father: "I wish it may be said of Louis Agassiz that he was the first naturalist of his time, a good citizen, and beloved of those who knew him." No higher praise can be given him than to say that all of this came true.



LOUIS AGASSIZ

Agassiz was born in Switzerland, not far from the shores of Lake Neuchâtel. He studied medicine at the universities of Zurich, Heidelberg, and Munich, but before his course was completed was invited to assist a naturalist in a study of Brazilian fishes. This work led to extended investigation of European fishes, and the study of fossil fishes in turn stirred his interest in geology. In 1847 he became a professor at Harvard University, where he founded the Museum of Natural History, now world-famous as the Agassiz Museum. Another forward step, due to him, was the summer school on the island of Penikese in Buzzard's Bay, opened in the year of his death. This was the first zoological laboratory built amid the haunts of the animals to be studied. Over his grave in Mount Auburn Cemetery, Cambridge, is a great boulder, brought from the glacier in Switzerland where he made his first important observation on geology, and the pine trees which shelter it were brought from the little village in which he was born.

Alexander Agassiz (1835-1910), son of Louis Agassiz, came to the United States from his Swiss home in 1849, two years after his father had accepted an appointment at Harvard University. The son, under the father's guidance, made a special study of zoology and geology, and was graduated from Harvard in 1857. Though he was interested chiefly in the animals of the sea, and became one of the world's authorities on fishes, his geological studies were of great value to the world after 1866, when he devoted most of his time to the study and development of mines. His investigation and engineering skill turned the Calumet and Hecla mine in Michigan from an unpromising venture to one of the richest copper mines in the world. Of his wealth, derived from this source, he gave about

\$1,000,000 to Harvard University to further the work in zoology begun there by his father, and contributed generously to other educational and charitable causes.

AGASSIZ, LAKE, an ice-margin lake of late Pleistocene time (see **GLACIAL EPOCH**). As the ice receded from the region of the present Minnesota, the Dakotas, and Manitoba, it left a shallow bed in which Lake Agassiz formed. When at its largest extent, the lake was five times the area of Lake Superior. As the ice along its northern border melted, its waters drained off, and several smaller lakes were left in the deeper parts of its basin. The ancient shore lines of the region may be easily traced to-day. The level plain through which the Red River of the North makes its way is the ancient bed of Lake Agassiz. The rich silt which the lake waters deposited makes this plain one of the most fertile wheat-growing regions in the world.

Related Subjects. The reader is referred in these volumes to the following articles:

Manitoba (Surface)	Winnipeg, Man.
Red River of the North	Winnipeg Lake

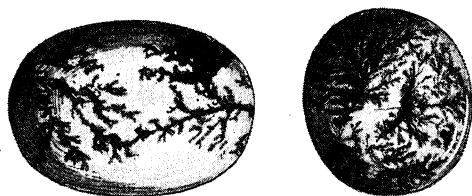
AGASSIZ ASSOCIATION, an organization which has been extraordinarily successful in its purpose of interesting young people in nature study. Named in honor of Louis Agassiz, the great nature student and teacher, it has aimed to carry out the conviction he expressed in the words, "The book of Nature is always open, and all that I can do or say shall be to lead young people to study that book, and not to pin their faith to any other." It has therefore placed emphasis on direct observation rather than on reading about natural objects.

The association was founded in 1875 by Harlan H. Ballard, and has spread until it has branches in most civilized countries. The membership varies from 12,000 to 15,000. In addition to the society's offer of free correspondence instruction in nature study, there are prizes for original research work. Association headquarters are at Sound Beach, Conn., from which place directions may be obtained if it is desired to organize a local association. See **AGASSIZ** (Louis).

AGATE, a variety of fine-grained quartz, usually classified as chalcedony (which see). It is a little harder than steel, but more brittle, and takes a high polish; it is therefore in demand for ornaments and jewelry. Agates are variegated in color, with bands of white, gray, brown, yellow, blue, or black; or the colors may be so blended as to present a cloudy, mosslike appearance. They are formed in cavities in rocks by layers of silica deposited by water.

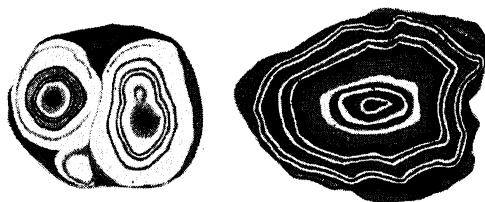
Agates are found in Austria and Germany, where their polishing is an important industry,

and in India and many parts of the United States and Canada. The principal commercial supply, however, comes from Brazil and Uruguay. Polished agates, which are often put



MOSS AGATES

through various processes to heighten the color effects, are used for knife handles, breastpins, watch charms, vases, and other ornamental purposes. Chemists use mortars and pestles



CROSS-SECTIONS OF AGATES

At left, onyx agate; at right, bull's-eye agate.

of agate to crush hard substances, and chemical balances are supported on "knife-edges" of agate, which is not affected by moisture or chemical fumes. See QUARTZ. T.B.J.

AGATE LINE. See ADVERTISING (Magazines and Newspapers).

AGAVE, a ga' vee. See CENTURY PLANT.

AGE, a term used to designate any stage in the physical life of a person or animal; the time at which an individual assumes legal responsibility for himself; periods of history with special characteristics; and the divisions into which the history of the world and of man may be separated according to geology, archaeology, etc.

Human Age. In human life, "one man in his time plays many parts, his acts being seven ages." But the seven ages of Shakespeare, in which man passes from a helpless infancy to an equally helpless senility, are usually classed in the four divisions of *infancy*, *youth*, *manhood*, and *old age*.

Legal Age. This term marks the time of life at which an individual becomes fully responsible to the law for his acts and obtains all the rights of a citizen. Legal manhood or womanhood is attained at twenty-one years in most jurisdictions, though in some states women become of age at eighteen, except for voting privileges. The age, whether eighteen or twenty-one, is completed on the day preceding that anniversary of one's birth.

Historic Ages. Hesiod, a Greek poet who followed Homer, divided human history into five periods, on a mythological basis. First came the age of Saturn, the *Golden Age* of happiness and simplicity, followed by the reign of Jupiter, the *Silver Age* of toil and lawlessness. The *Bronze Age*, of Neptune, was filled with war and violence. The *Heroic Age* was the time of those demi-gods who fought at Troy and Thebes. Hesiod's own period, the *Iron Age*, he considered the most degenerate time of all. Ovid, Lucretius, and many other writers adopted his idea.

The term *Golden Age* has come to mean the point in any country's history when its general culture and prosperity, its literature and art have reached their highest development. Thus, the Elizabethan Age of England is also called its Golden Age.

Successive epochs in history with special characteristics are named either with reference to their distinguishing quality or to a country, sovereign, or leading figure. Some of the more important ages are given below:

Alexandrian Age, the period during and after the reigns of the Ptolemies, when the Mediterranean city of Alexandria, in Egypt, was the center of Greek learning and culture. Euclid, the father of scientific geometry; Archimedes, the physicist; and Apollonius of Perga, whose work on conic sections still exists, were all members of the brilliant group of scientists, philosophers, and poets who were attracted to the city's academy of arts and sciences.

Augustan Age, the most brilliant period of Roman literature, under the reign of the Emperor Augustus, who aided and encouraged writers. It was the time of Horace, Ovid, Livy, and Vergil, the age which saw the highest development of the Latin language. In England the term was later applied to the age of Steele, Addison, and Swift, who lived in the reign of Queen Anne, and in France, to the reign of Louis XIV.

Age of Pericles, the time of Athenian supremacy in literature, art, culture, and politics.

Age of Reason, a short period in the French Revolution, during which reason was deified and Christianity outlawed. Hébert, its leader, was executed by Robespierre.

Elizabethan Age, the reign of the English Queen Elizabeth; the finest example of its literary development is Shakespeare (which see).

Victorian Age, the period covering the reign of Queen Victoria, during which progress in art, literature, and science was made.

Dark Ages. See article DARK AGES.

Middle Ages. See article MIDDLE AGES.

Feudal Age, that period in European history from the ninth to the sixteenth century (see FEUDAL SYSTEM).

Scientific Ages. The use of the term *age* in connection with geologic periods of time and their representative fauna is explained in the article GEOLOGY. An example of such use is the term *Age of Man*, to designate the present geologic era.

Archaeologists use the word to indicate

periods of time according to divisions of cultural progress, as the Iron Age, Stone Age, Bronze Age. For example, the Bronze Age is so named to represent the period when primitive man advanced from the use of stone for his implements to the use of a mixture of copper and tin, or bronze.

Related Subjects. The reader is referred in these volumes to the following articles:

Alexandria	Hesiod
Archaeology	Iron Age
Archimedes	Pericles
Augustus	Ptolemy
Bronze Age	Stone Age
Elizabeth (Queen)	Troy
Euclid	Victoria (Queen)

AGEE, FANNY HEASLIP LEA. See **LEA, FANNY HEASLIP.**

AGENOR, a je' nor, father of Cadmus (which see).

AGENT, in law, one who is employed to represent another individual, or a company, called the *principal*. The relation between them is called *agency*. An agent may be *general* or *special*, the latter acting by authority for his principal in a special business only. The position of agent is one of trust, calling for faithful performance of specified duties. The compensation varies according to the responsibility incurred and the work done. A definite salary may be agreed upon, or the agent may receive a commission figured at a certain per cent of the value of the business resulting from his labor.

An agent is himself liable to third parties when he does not disclose, or only partially discloses, his employer, but not otherwise, unless he exceed his authority. The employer is not responsible for acts of the agent which are unauthorized. The principal is generally liable to third persons for civil offenses committed by the agent when acting within the scope of his agency; but this does not relieve the agent of personal liability himself. As a means of enforcing payment for his services, the law gives the agent a lien upon the property of the principal which may be in his hands. See **CONTRACT; LIEN.**

AGE OF FISHES. See **DEVONIAN PERIOD.**

AGE OF ICE. See **GLACIAL EPOCH.**

AGE OF MAN. See **AGE (Scientific Ages); GEOLOGY.**

AGE OF PERICLES. See **AGE (Historic Ages).**

AGE OF REASON. See **AGE (Historic Ages).**

AGGLOMERATE. See **CONGLOMERATE.**

AGINCOURT, ah zhan koor', BATTLE OF, a famous battle of the Hundred Years' War (which see) fought in 1415. In this battle, the heavily armed French, numbering about 60,000, were totally routed by the English archers of Henry V, whose force numbered only 15,000. The French nobility was almost

destroyed in this conflict. The village of Agincourt, where the battle took place, is in the department of Pas de Calais, in the northern part of France.

AGLAI, a gla' yah, one of the three Graces (which see).

AGLE, a' g'l, a daughter of Hesperus. See **HESPERIDES.**

AGNES SCOTT COLLEGE. See **GEORGIA (Education).**

AGNOSTIC, a person who believes that no one can really prove that a God exists, or that He does not exist. He takes the position of one who says, "I do not know." The belief of the agnostic is based on the theory that the human mind can offer proof only for the things that are known through the senses; that is, that can be touched, or seen, or heard, etc. Likewise, he argues, man cannot prove many things that seem to be real, not even his own existence. An agnostic is not an atheist, for the latter denies that there is a God. *Agnosticism* is the name given the principles of the agnostics. An old school of Greek philosophers called Sophists (which see) held the same theory.

Derivation. *Agnostic* is a word of Greek origin, and means *unknowable*. It was first used in print by Thomas H. Huxley (which see) in 1869.

AGOMSKA ISLAND. See **JAMES BAY.**

AGOUARA, ah goo ah' rah. See **RACCOON,** for classification.

AGOUTI, ah goo' te, the name of several rodents, or gnawing animals, related to the porcupines. There are about a dozen species, all belonging to South America and the West Indies. The common agouti, or *yellow-rumped cavy*, is about the size of a rabbit. It burrows



AGOUTI

in the ground or in hollow trees, roams at night, and lives on vegetables and fruit, though eating meat whenever it can be obtained. The agouti grunts like a pig, and is as greedy; hence where it is common it does much injury to crops. Its flesh is white and palatable. It is readily domesticated, but is too destructive to make a desirable pet.

W.N.H.

Scientific Name. Agoutis belong to the family

Dasyproctidae and the genus *Dasyprocta*. The common agouti is *D. agouti*.

AGRA, *ah' grah*. See INDIA (Cities).

AGRAPHIA, *a graf' i ah*, a form of aphasia (which see).

AGRA'RIAN LAWS. The word *agrarian* is derived from the Latin *ager*, meaning *field*, and was applied to all those laws enacted in ancient Rome regulating the division of the public lands, together with the disposition of conquered territory. Originally the right to the use of public land belonged only to the ruling class, or patricians; later, when the plebeians, or commoners, were granted allotments by the agrarian laws, they were often unfairly treated in the sharing of it. Hence, there arose much discontent among the plebeians, and various remedial laws were passed, some of them giving rise to the fiercest struggles which disturbed the Roman state. Few of the agrarian laws were ever seriously put into execution. See PATRICIANS; PLEBEIANS.

Modern Laws. Since the World War, agrarian legislation has been one of the outstanding features of the economic history of Russia and of most of the Central European countries. Private ownership has been abolished in Russia, and the peasants themselves are farming over ninety per cent of the agricultural land, under government ownership. Agrarian laws to benefit the peasants have also been passed in the Baltic states, Rumania, Bulgaria, Yugoslavia, Poland, Hungary, and Czechoslovakia. In general, the new agrarian policies look toward the subdividing of the large estates and the creation of a class of independent farmers. These innovations have had varying results. In Yugoslavia, for example, many of the farmers who have been given tracts of land to cultivate on their own initiative have found themselves at a disadvantage under conditions requiring larger capital, different machinery, and an assumption of responsibility. The practical working out of these post-war problems is a matter of years, or even of generations. See articles on the countries named.

AGRICOLA, *a grik' o lah*, GNAEUS JULIUS (A. D. 37-93), a Roman general who served his country in many capacities, but is best remembered for his vigorous rule over the island of Britain. During the period of his governorship, from 77 to 84 A. D., the Britons submitted to Roman rule for the first time, and were persuaded to adopt the customs of their conquerors. Agricola also subjugated the tribes in North Wales, and defeated the warlike Caledonians, who lived north of the firths of the Forth and the Clyde. Between these firths he built a line of forts to protect the Britons. Agricola's life, by his son-in-law, Tacitus, is regarded as a classic in the field of biography. See TACITUS; ROME; ENGLAND (History).

AGRICULTURAL COLLEGE OF KANSAS. See KANSAS (Education).

AGRICULTURAL ECONOMICS, BUREAU OF. See AGRICULTURE, UNITED STATES DEPARTMENT OF.

AGRICULTURAL EDUCATION. The placing of American agriculture on a scientific basis, with its elevation to the rank of a profession, is distinctly the work of the last half of the nineteenth century. There was a time, no more than a generation or two ago, when the average farmer looked with contempt on what he called "book farming." Who, he asked, could tell him more about his farm than he himself knew? He plowed and harrowed, planted and harvested, as he had always done, and as his ancestors had done before him. Most of his working principles were the outcome of his own experience or of the tradition of the neighborhood. When chemists and biologists first began to explain to him how he could improve his methods, they got little thanks for their offered help. In the course of time, however, farmers began to see the value of the facts which scientists were slowly establishing by research work of agricultural experiment stations, and then came the development of a system by which the individual farmer might learn to use the knowledge which others had gained for him.

To-day the education of boys and girls for life on the farms reaches from the common school to college. It goes beyond: it reaches older people whose school days were gone before the dawn of the new era, and it continues to affect those who have had the training for farm life and are actually engaged in agriculture. It gives them not merely the facts which help them to raise crops, but, in the words of Liberty H. Bailey, a great authority on agriculture at Cornell University, it is "the expression of a rapidly crystallizing desire to make rural life all that it is capable of becoming and to understand and to realize in the best way all the natural products of the earth."

The modern system of agricultural education naturally falls into four divisions: (1) instruction in colleges and universities; (2) instruction in secondary schools; (3) instruction in elementary schools; (4) agricultural extension.

Institutions of Collegiate Rank. It is a remarkable fact that the first systematic instruction in American agriculture was begun by institutions which stood at the top of the educational scale. Courses in chemistry and in animal husbandry were being taught in the Philadelphia Academy (now the University of Pennsylvania) and in King's College (now Columbia University), respectively, about the middle of the eighteenth century. In 1792 chairs of botany and agriculture were organized in the latter institution. During the next

few years a general awakening of public interest in agriculture gradually made its way over the country, and agricultural societies began to take form. One of these, the Massachusetts society, used its influence in securing the establishment of a professorship of natural history at Harvard College in 1804.

The movement thus begun was interrupted by the outbreak of the War of Secession, but one state, Michigan, was fortunate in having laid a permanent foundation for agricultural instruction during the pre-war period. In 1850 the state adopted a constitution in which some far-sighted person had procured the insertion of a clause making it obligatory for the state to maintain a school of agriculture, either independently or in connection with the state university. In accordance with this provision, the state agricultural college was opened in 1857; it is the oldest institution of its kind now in existence in the United States. In 1859 Pennsylvania and Maryland established similar colleges, which are successful institutions to-day.

Land-Grant Colleges. Instruction in agriculture, however, was first put on a firm scientific footing in 1862, by the passage of the Morrill Act. It granted to each state 30,000 acres of public lands for each member it had in Congress, the entire proceeds of the sale of this land to be set aside as a perpetual fund for the benefit of colleges of agriculture and mechanic arts.

At first the "land-grant colleges," as they were called, had a hard struggle. They received recognition neither from the farmer nor from other colleges and universities. Gradually the value of the work done by them became apparent, and a second Morrill Act of 1890 and several later laws provided considerable increases in the annual appropriations.

According to the law of 1890, each state was to receive \$15,000 and an annual increase until the total was \$25,000 a year. This act also made provision for colleges attended solely by colored students. In 1907 the Nelson amendment made further appropriations, and the land-grant colleges now receive \$50,000 a year under the three acts. Other legislation has provided for the establishment and upkeep of experiment stations and extension activities (see AGRICULTURE; AGRICULTURAL EXPERIMENT STATIONS; AGRICULTURAL EXTENSION WORK). The Nelson amend-

ment made special provision for the organization of teacher-training departments in the land-grant colleges, and this phase of the work has made rapid progress.

Including colleges for negro students, there are in the United States sixty-five land-grant colleges teaching agriculture. Three others have been established in outlying territories, namely, at Honolulu (H.I.), Fairbanks (Alaska), and Mayaguez (Porto Rico). In most of these institutions, engineering and the mechanic arts are also taught. In some of the states, the college of agriculture is an independent institution, and in others it is a part of the state university. At the University of Minnesota the agricultural school is designated officially as a department. For further information on this point, the reader is directed to the sections on *Education* in each of the state articles.



RAMBOUILLET RAM

Secondary Schools. It was not until thirty years after the establishment of the first agricultural colleges that the first successful agricultural high school was established. This was in 1888, in connection with the University of Minnesota. Though its success was immediate, by 1898 there were only ten secondary schools giving agricultural instruction. In 1901 Wisconsin passed legislation authorizing the establishment of two such schools, and the movement developed to such an extent that, according to a

survey made by a national commission appointed by President Wilson, there were about 300 public schools teaching agriculture, and instruction was being given to over 60,000 pupils. As a result of general interest in vocational education, Congress passed the Smith-Hughes Act, which went into effect July 1, 1917. This act was designed to further the development of vocational instruction in high schools all over the country [see SCHOOL (Federal Aid)]. For the further support of agricultural education, it provided an appropriation of \$500,000 the first year, and an annual increase until 1925-1926, when a yearly maximum of \$3,000,000 was reached. Each state receives an allotment based on its rural population, but the Federal appropriation must be met in each case by an equal appropriation from the state. Special appropriations were also made for the training of agricultural teachers and supervisors. Through the operation of the Smith-Hughes Act, secondary agricultural schools have been established in every state in the Union. The instruction given is of a

practical nature, including project work on the land itself. Persons of adult age are permitted to take the courses, and where expedient, part-time courses and evening classes are maintained. In addition to the Smith-Hughes schools, some of the states independently maintain high schools giving agricultural courses.

Elementary Schools. The teaching of agriculture in the elementary schools is required by law in about twenty states, and in others the inclusion of agricultural courses in the curriculum is optional with the state boards of education. There is lack of agreement among educators as to the value of vocational agriculture in the lower grades, and little progress has been made in standardizing the courses and methods of presenting them. In many states, the laws referred to above are but poorly enforced. In general, the tendency is to correlate agriculture with other branches of the curriculum, giving the children a background which will facilitate their work in the higher grades. Many authorities believe that the work in the elementary schools should emphasize the pupil rather than the subject; that is, the child's eyes should be opened to the vegetable and animal life about him, and he should be made to feel his relation to this environment. Up to the sixth year of school, this work is usually a form of generalized nature study, but thereafter it is directed toward more purely agricultural topics. See *EDUCATION* (Modern Tendencies in Education), page 2112.

In Canada. There are six agricultural colleges in Canada, four of which are branches of provincial universities, at Vancouver (B.C.), Edmonton (Alta.), Saskatoon (Sask.), and Montreal (Que.), respectively. At Winnipeg (Man.) and Guelph (Ont.) there are agricultural colleges affiliated with the provincial universities solely for the purpose of conferring degrees. All of these institutions have faculties of resident instruction, extension, and experiment, and each requires a four-year course before awarding a degree. Schools of agriculture giving shorter courses are located in Nova Scotia, Quebec, Ontario, and Alberta. See *AGRICULTURAL EXPERIMENT STATIONS*; *AGRICULTURAL EXTENSION WORK*. C.F.C.

AGRICULTURAL EXPERIMENT STATIONS, institutions maintained for the purpose of giving farmers the benefit of modern research and practical investigation. Over sixty of these stations are in operation in the United States. When the land was first broken to the plow and its fertility seemed inexhaustible, farmers saw no need of changing old methods for new. Moreover, propaganda for scientific farming would have received scant consideration at a time when men were

struggling to gain a secure foothold in the wilderness. As time passed and the land began to lose its richness, the need of better farm practices made itself felt; since the middle of the nineteenth century, when experiments were conducted in Pennsylvania, Michigan, and Maryland, the experiment station has had a vital part in the development of American agriculture.

The first station regularly organized in America was established at Wesleyan University, Middletown, Conn., in 1875. The work was supported by gifts of money and by small state appropriations. The record of growth from this modest beginning, when less than \$4,000 per year was available, to present expenditures reaching millions, is a recital that holds both interest and inspiration. The first Federal aid for actual experiment was granted in 1887, when Congress passed the Hatch Act. This legislation gave each state a yearly appropriation of \$15,000 to carry on research at the state agricultural, or land-grant, college. At this time, land-grant colleges were operating under endowments derived from the sale of public lands, as provided by the Morrill Act of 1862 (see *AGRICULTURAL EDUCATION*). No provision had been made for regular experimental work, and the appropriations of the Hatch Act met a real need. In 1906, in accordance with the Adams Act, an additional \$15,000 per year was appropriated, and in 1925 the Purnell Act provided for a graduated increase which doubled the appropriation after 1930, making it \$60,000.

The sixty or more stations in continental United States have a personnel of over 2,700 workers, and a total yearly revenue, including Federal and other sources, of over \$10,500,000. Not only do the states themselves make liberal appropriations, but considerable revenue is derived from the sale of products and from fees charged for inspection and other technical service. Each state has at least one station, several have two, and Louisiana operates five. One of these is devoted to the study of sugar, and one investigates rice. Arkansas maintains substations for the study of cotton and rice. Government support is also given to experiment stations in Alaska, Hawaii, Porto Rico, the Virgin Islands, and Guam. These are under the supervision of the Federal Office of Experiment Stations at Washington.

That there may be as little duplication as possible, each station carries on those special lines of original investigation in which the particular locality is interested. For example, the Wisconsin station is especially interested in problems of dairy husbandry, while the Kansas investigators do a great deal of research work in connection with wheat growing. In Iowa and Illinois, attention is paid to cattle and hog production and to the

improvement of farm crops. The sugar and rice experimental activities of the South have already been mentioned. In each state the local work includes investigations in the following:

The Soil, its chemistry, physics, and biology. This field includes drainage, irrigation, tillage, crop fertility, rotation of crops, and fertilizers.

Plant Life, its physiology, chemistry, nutritive value, and history. New varieties are studied; increased productiveness is sought; new methods of selection and breeding are investigated; injurious insects and bacteria are studied with a view to eradication, and preservation of forests and reforestation receive attention.

Animals, breeds; diseases and their control; chemistry of foods; dairying; feeding; etc.

The progressive farmer has a vital interest in the energetic work of the experiment station in his state. It works for him. If he cannot find the proper fertilizer for his soil, he can send some soil to the station for analysis. He will be told what it lacks and receive suggestions upon which he may act. He may inquire into irrigation questions; he can get instruction which will increase his success with poultry. The station (in some states) will send an expert, at cost, to consult with him on matters which may not have been standardized. He may write for and receive, without cost, bulletins on any farm subject which may be among the publications which are prepared by his station.

In Canada. Experimental work of a similar nature is being carried on in Canada in all of the provinces and territories. Most of the experiment stations are under the control of, and are supported by, the Dominion government, but Ontario, Manitoba, Alberta, and British Columbia have established independent stations. The station at Ottawa, known as the Central Experiment Farm, is the headquarters of the work under the Dominion government. See AGRICULTURAL EDUCATION; AGRICULTURAL EXTENSION WORK. C.F.C.

AGRICULTURAL EXTENSION WORK, a form of agricultural education that has for its object "a more efficient and profitable agriculture, an adequate supply of food and clothing for the nation, and a larger social, recreational, and educational rural life." In the United States, agricultural extension is being carried on through mutual cooperation between the farm people on the one hand, and the Federal Department of Agriculture and the agricultural colleges, on the other. According to a report made by the chief of the Office of Coöperative Extension Work at

Washington, there are directly engaged in the work about 5,000 Federal and state employees giving full time to the work, 200,000 volunteer farm men and women acting as chairmen of committees or sponsors of local improvement work, and about 1,500,000 farm and home demonstrators. The Federal government spends about \$7,000,000 annually to carry on this service, and fully \$12,000,000 in addition is appropriated by states, counties, and individuals.

Agricultural extension is the outgrowth of that widespread interest in farm life that culminated in 1862 in the establishment of the land-grant colleges and the organization of the Federal Bureau (now Department) of Agriculture. In 1875 the first regular experiment station was organized, and with the growth of this type of institution the practice of issuing reports of investigations and discoveries made rapid progress.

Somewhat later the Department of Agriculture and the state agricultural colleges began to send demonstrators into the farming districts to instruct the farmers in such matters as control of insect pests, fertilization practices, and cropping systems. Some of the demonstrators became interested in work with the boys and girls, and corn clubs, pig clubs, canning clubs, and so on, sprang up and flourished.

Practical work in home economics was also carried on among the farm women. The extent of the benefits enumerated is not often realized by people living in cities, but the results of the labor of the thousands of people are reflected in the quantity and quality of our foodstuffs.

By 1914 the necessity of placing the extension work on a permanent basis had become apparent, and in that year Congress passed the Smith-Lever Act, appropriating funds for "extension work in agriculture and home economics, to be carried on coöperatively by the state colleges and the Department of Agriculture through field demonstrators, publications, lectures, and otherwise." Under the act, funds supplied by the government must be increased by state, county, or private contributions, and it is evidence of the value placed upon the work that money from these other sources has always exceeded what the law requires. C.F.C.

Related Subjects. Detailed information concerning agricultural extension work will be found in the articles **BOYS' AND GIRLS' CLUBS; CANNING CLUBS; FARMERS' INSTITUTE; COUNTY AGENT.** See, also, **AGRICULTURE; AGRICULTURAL EDUCATION; AGRICULTURE, DEPARTMENT OF.**



PROUD HEREFORDS

THE ADAMS FAMILY PROVES THE VALUE OF AGRICULTURE

Mr. and Mrs. Adams with their children, John, 14, and Mary, 12, lived in the city. Like many other city children, John and Mary knew but little of the country, and did not seriously consider farming or anything connected with it. Their father and mother, however, had come from the farm, and they decided to help John and Mary to obtain correct ideas of the country and of a life such as they had lived in their younger days.

"John, where did this bread come from?" asked Mr. Adams, at dinner.

"Why, mother bought it at the baker's, I suppose."

"Very well, but where did the baker get it?"

"Oh, I know," said Mary, "he makes it."

"But what is it made of?" continued the father.

"There is flour in it," said John, "and water, and—and—lots of other things."

"A boy never knows anything about cooking; let me tell," said Mary. "Bread is made of flour, water, and yeast and—what else do they put in it, mother?"

"I don't see as you know much more about it than I do," said John.

"You children can learn how to make bread some other time," said Mr. Adams; "I want to know where the baker got his flour."

"He bought it of the wholesale grocer," replied John.

"Well, where did the grocer get it?"

"That is about as far as I can go," said John. "I have often wondered where all the things we eat come from, but I have so many things to study in school that I don't have time to read about anything more."

"Well," replied the father, "suppose we make a little study of these things at dinner. Let us begin with the bread. What you and Mary have said is true, but we need to look into the subject a little further, if we would know the real source from which we obtain bread and all other articles of food. The real source of all these is the farm, and were it not for the farmers all the people who live in the city, as we do, would soon be without food."

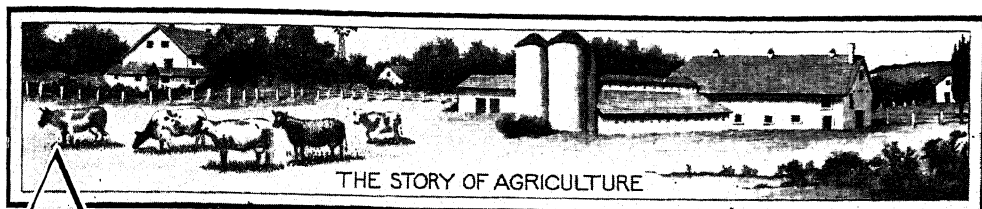
"Why, I never thought of that before; I never supposed the farmer amounted to much, anyway," said John. Mary expressed a similar idea, and both asked their father to tell them about those common articles of food which we all eat without giving a thought to the source from which they come, or the labor required to prepare them for our use.

During the next few days Mr. Adams took the children on a number of imaginary journeys. With him they visited in fancy the great wheat fields of the Dakotas and Canada, the corn belt in Illinois and Iowa, the cattle ranches of Texas and Montana, the Western sheep ranges, the fruit orchards of the Pacific states, the Great Lakes district, and Florida, the dairy farms and creameries of Wisconsin, the sugar plantations of Louisiana, the beet farms of Michigan and Colorado, and the poultry and truck farms near some of our great cities. Then he took them to far-off lands—to the coffee plantations of Brazil, the tea gardens of Formosa, the rice plantations of China, and the spice groves of India.

Before these imaginary excursions were ended, John and Mary learned that everything they ate, except salt, came from a farm in some part of the world and that agriculture is carried on in every country. But Mr. Adams did not stop here. In the same interesting way he led the children to the study of cotton, flax, wool, silk, rubber, leather, and other products of plants and animals that provide the human race with clothing and household necessities in endless variety. He pointed out that even the furniture and framework of their house, and the books they used in school, could be traced to trees that grew in the farm woodlot or the forest.

As a final exercise, Mr. Adams asked the children to make a list of all the industrial, commercial, and financial establishments they could think of that depend on or are essentially connected with agriculture. They listed first the establishments that make direct use of the raw materials of farms, ranches, and plantations, such as flour mills, packing houses, canneries, cotton, linen and woolen mills, and sugar refineries. When they came to the industries that use farm products indirectly, the items seemed endless. Another interesting field was the survey of establishments that manufacture articles essential to the operation of the farm, such as tools and machinery, rope and cordage, fertilizers and insect sprays, lubricants, and so on. Transportation and marketing, credit and banking were included in the survey, and when their studies were completed the children had gained a new conception of the fundamental importance of the farmer and his work.

[The above suggests profitable surveys on a multitude of subjects
that can be carried on by "journeys" through THE WORLD BOOK.]



AGRICULTURE is man's cultivation of the soil and his care and use of plants and animals, the object of these pursuits being the production of food and clothing for mankind. Before the time of recorded history, primitive men subsisted on the products of Mother Earth that were ready to their hand—the flesh of forest animals, fish, honey, fruits, herbs, nuts, and other plant foods that Nature provided without man's aid. While the capture and killing of wild beasts often demanded considerable skill and courage, those early methods of procuring food represented a mode of life that led to neither permanence nor progress. When natural foods failed, the tribes had to move elsewhere or succumb to famine; thus life was a struggle for existence, requiring a ceaseless expenditure of men's energy to defeat their greatest foe—starvation.

But in different parts of the world and at different periods, men began to see that Nature might be brought under control. They learned how to tame and utilize wild animals—goats, cattle, swine, sheep, camels, and lastly, the horse. These faithful servants provided skins for tents and clothing; they supplied food in the form of milk, cheese, butter, and meat; they gave of their strength and labor as draft animals and burden bearers. It is probable that such domestication of animals preceded the selection and raising of food plants, but at some stage in the increasing control of his environment, man learned that certain plants were better for food than others, and could be grown from seed. Accidentally, perhaps, someone noticed that plants grew better where the ground was prepared for the seed, and cultivation of the soil had its rude beginning when first the land was scratched with a sharpened stick before the seed was planted. To these early times belongs also the invention of the plow, originally a forked stick that some primitive farmer held in position and one or two of his companions dragged over the ground. Later, slow-moving oxen hauled the crude implement. The seed dropped into the crooked furrow sprang up and increased manyfold, teaching the lowly husbandman that in the cultivation of the soil and in the care of his crops, man may free himself from the terror of famine.

In such manner was started the train of invention that was to make fruitful vast areas of the earth and permit mankind to multiply

and prosper. There is both truth and poetry in these lines from *The Song of the Plow* (by Harry Kemp):

It was I who raised from famine all the hordes and
tribes of man;
I have never ceased nor faltered since the tilth of
fields began,
Since the first poor crooked stick was drawn across
the wondering earth,
While upon the man who used it all his tribesmen
gazed in mirth.

Agriculture the Basis of Life. Eventually, in the history of every people, the nomadic form of life gives way to settlement in villages. Such settlement took place in Egypt, Babylonia, and China thousands of years before the Christian Era. In some other parts of Asia and in Europe, the change came later, but there has been a civilization based on agriculture in most parts of the Old World for many centuries. With the development of a settled community life, agriculture could be carried on by a portion of the workers, and the whole population assured of food. Thus there was opportunity for the practice of other occupations, for the rise of professions, and for expansion of trade and commerce. Daniel Webster once said, "When tillage begins, other arts follow. The farmers, therefore, are the founders of civilization." What was true in times past is just as true to-day. That agriculture is the foundation of modern existence is brought out in the story of the Adams family, on the preceding page, the events of which might be taking place in countless homes.

Important Elements of Modern Agriculture. Though we find the roots of agriculture in the practices of prehistoric peoples, its earlier development was very slow. In fact, more progress has been made in agriculture in the past two centuries than in all the centuries preceding. Even to-day in some parts of Europe, and in most parts of the Orient, farming is carried on in a very primitive manner. Many a plowman in the Old World guides a forked stick as he turns the furrow, and duplicates the customs of Bible times when he sows the seed and harvests the grain.

The rise of modern agriculture is seen most clearly in its development in the United States and Canada. Three centuries ago, these countries were peopled by Indians whose farming practices were restricted to a rather

primitive tillage of the soil with crude hand tools, and the raising of corn, vegetables, and a few other crops. The Pueblo Indians in the Southwest grew cotton on plots which they irrigated by hand. The Indians also developed a system of fertilizing the soil with fish and shells. Nevertheless, without desiring to minimize the achievements of these people, we may say that their cultivated plots were extremely limited in comparison with the forested and untilled areas, and their crops were supplementary to their main food supplies, obtained through hunting and fishing.

To-day the United States produces nearly seventy per cent of the world's corn, sixty per cent of its cotton, fifty per cent of its tobacco, and about one-fourth of all the cereal crops grown throughout the world. Its farms yield an abundance of fruits and vegetables, and large crops of grasses and legumes for fodder. The number of its cattle, horses, swine, sheep, and poultry runs into the millions. The value of all its farm property is about \$80,000,000,000, and sixty per cent of its six and a half million farms are owned by the men who manage them. Canada, which still has large areas of virgin prairie and a population less than one-tenth that of the United States, produces yearly crops valued close to a billion dollars; and in respect to variety and quality, its livestock and plant products vie with those of its southern neighbor.

The elements that have given these countries their significant place in world agriculture are summarized below. They represent the outstanding developments in modern farming, and indicate the gap between advanced agricultural methods and those which prevailed before the nineteenth century.

(1) **Use of Improved Implements.** In McMaster's history of the United States we read that the "Massachusetts farmer who witnessed the Revolution plowed his land with the wooden bull-plow, sowed his grain broadcast, and when it was ripe cut it with a scythe and threshed it out on his barn floor with a flail." Hand labor and hand tools were characteristic of American agriculture until about 1850, after which improved machinery came into general use. Except on small fields, the walking plow, turning a single furrow, has been superseded by the riding double-furrow plow, or by the gang plow turning dozens of furrows at a time.

The modern farmer also has his spike-tooth or disk harrow, his weeder and roller, his drag and cultivator. Special seeding machines have supplanted the sower who followed the furrow with his seed bag on arm; these are combination devices that open the furrow, feed the seed at a uniform rate, and cover it at an even depth, doing in a few hours what formerly required the labor of days. Fertilizer distributors and manure spreaders enable the farmer to keep

his soil supplied with plant food, without back-breaking labor, and power-driven machines cut, bind, and thrash his crops. In the hayfield, mowers, tedders, rakes, and loaders have superseded the old pitchfork methods. Other modern farm implements include the cream separator, feed grinder, ensilage cutter, stump puller, and circular saw. Nor should we forget the gasoline engine that pumps water, and, in combination with a dynamo and storage battery, provides power for the electrical appliances that relieve the farmer and his wife of so much of the drudgery that was the lot of farm people a generation ago.

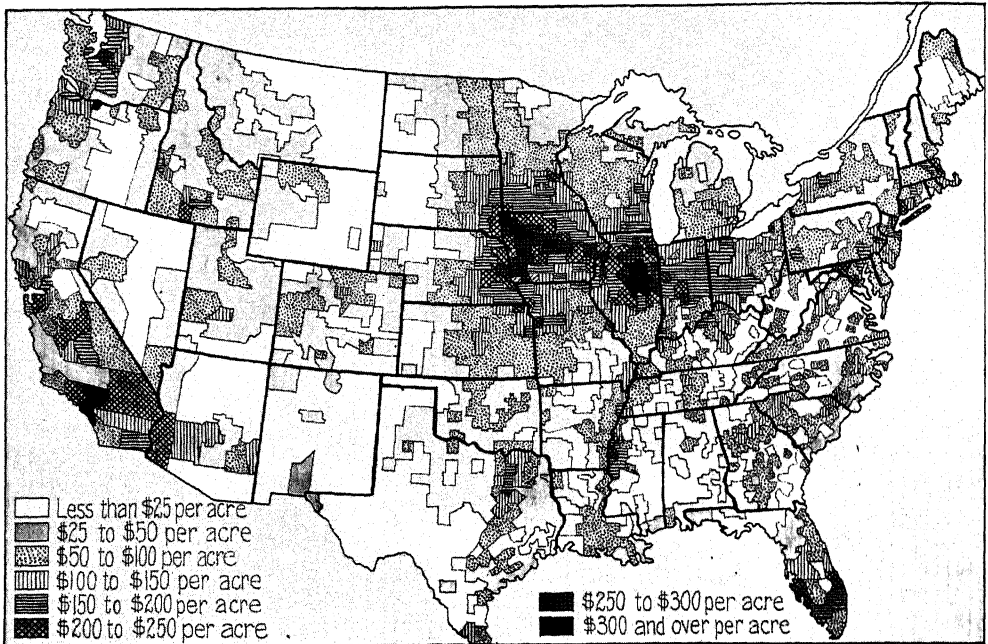
Appliances such as those mentioned above have made their way into the progressive farm areas of both the United States and Canada. In both countries, of course, there are sections where agriculture is still backward, or where small holdings make extensive use of machinery unnecessary. Even in these sections, however, there is nothing comparable to the peasant life of Europe.

(2) **Scientific Management of the Soil.** In a newly settled country, the tendency is to use the soil lavishly, partly because the richness of the virgin land seems inexhaustible, and partly because there is no time for conservation methods under the urgency and pressure of pioneer conditions. American farmers awakened to the necessity of better management of the soil when, in many sections, declining yields showed that the land was becoming exhausted. This movement at first spread westward, following the direction of settlement, and is now tending southward. The application of science to soil management is largely a development of the nineteenth century and later. Its most important phases are the adoption of proper cropping systems, the use of commercial and green-crop fertilizers, combined with the raising of livestock, and recognition of the effect of bacteria on the soil.

By adopting proper cropping systems, farmers avoid that depletion of the soil that comes through raising the same crop on a field year after year. In other words, they rotate their crops, so that no one type of plant food is drawn on too extensively. Rotation also helps in the control of insects and plant diseases, for often the enemy of a certain plant will die out on land given over to an entirely different crop. Rotation systems are chosen with reference to the locality in which they are to be used, and no one arrangement can be adopted everywhere. Generally speaking, a good cropping system will include a rotation of cultivated, small-grain, and legume crops, but in regions of sparse rainfall, where it is necessary to take advantage of whatever moisture may be available, such a rotation would not be successful. See **ROTATION OF CROPS; DRY FARMING; IRRIGATION.**

The FARMER FEEDS THEM ALL





AVERAGE VALUE OF FARM LANDS PER ACRE IN THE UNITED STATES

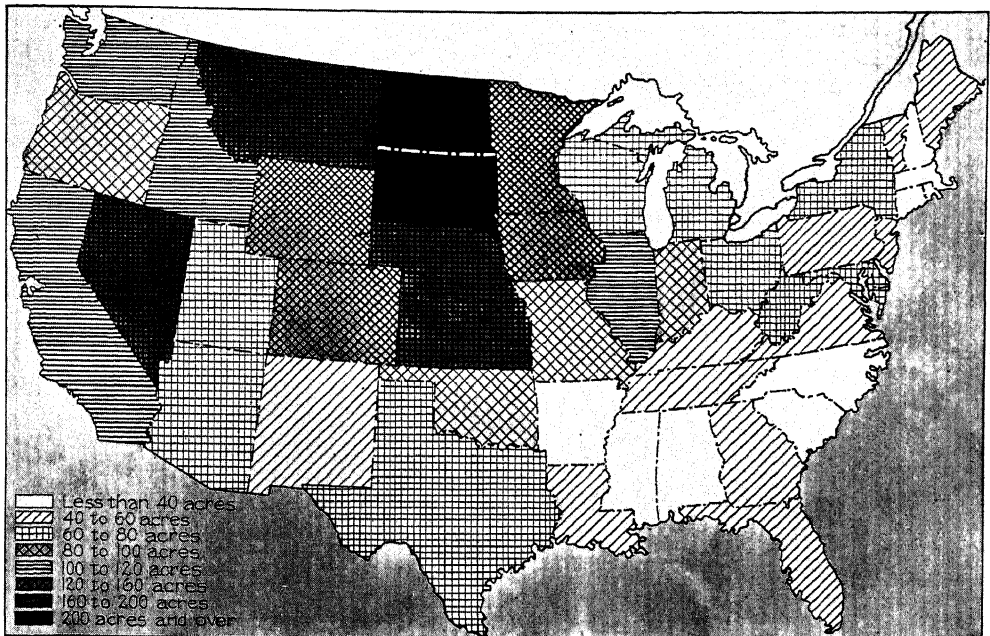
The widespread use of commercial fertilizers dates from the discovery by the German chemist, von Liebig, of a method of obtaining acid phosphate from bones by treating them with sulphuric acid. Two years later, in 1842, a process for making acid phosphate from phosphate rock was perfected in England. Other processes for securing the mineral substances needed by growing plants have been devised, and millions of tons of commercial fertilizers are now purchased every year by progressive farmers of the United States and Canada. Animal manure, bones, and other natural sources of plant food are valuable fertilizing materials, but in most cases, these are not obtainable in sufficient quantities (see FERTILIZER).

The rôle that bacteria play in the upkeep of the soil is an interesting one. It is one of the discoveries of the nineteenth century that some types of these microscopic plants have the power to combine the nitrogen of the air with other chemical elements and fix it in the soil. The microorganisms live in nodules on the roots of leguminous plants, such as clover, beans, and alfalfa. Because legume crops, when plowed under, release to the soil the nitrogen they have taken from the air, they are widely used as "green manure." They are also important in crop-rotation systems.

(3) **Improvements in Plant Husbandry.** The improvement of plants through the selection of seeds yielding the best product began in

the days of primitive agriculture. Plant breeding has a long history back of it, but modern methods of propagation have placed it on a scientific basis. Thousands of new and improved varieties of fruits, vegetables, and flowers have been produced, both by selection and by the crossing of different varieties. For example, the Kansas Agricultural Experiment Station has produced a rust-resistant hard winter wheat called Kanred, by selection methods, and the Canadian Department of Agriculture has created the valuable Marquis variety of wheat by crossing, or hybridization. Our best grades of potatoes, those with large, smooth-skinned tubers, are the result of breeding, and so, too, are such fruits as Concord grapes, Elberta peaches, and Bartlett pears. Countless other examples could be given. See BREEDING.

Another phase of modern plant husbandry is the control of plant enemies, including noxious insects and plant diseases. Such pests as the brown-tail moth, the cotton boll weevil, and the corn borer, which have caused immense losses to American farmers, are being fought with sprays and general control methods that are bringing these insects under subjection, though the battle is far from being won. Were it not for these efforts, the farmers would suffer the loss of most of their crops. The fight against smut, blight, rust, and other plant diseases is being conducted on the same principles and with a considerable degree of success.



AVERAGE ACREAGE OF IMPROVED LAND IN EACH FARM IN THE UNITED STATES

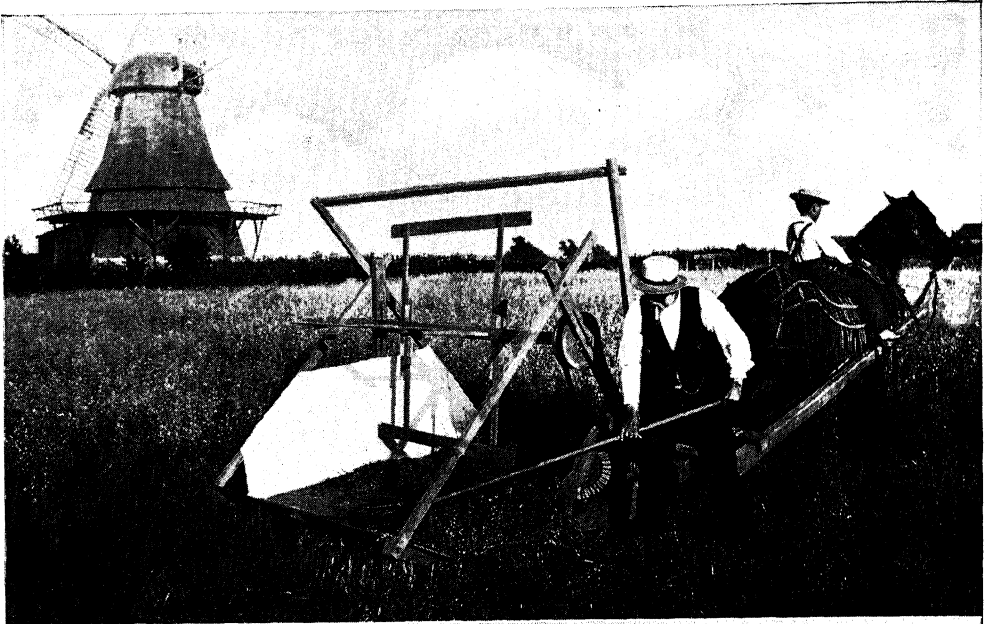
(4) Improvements in Animal Husbandry.

The fine specimens of horses, cattle, sheep, and swine that are being produced by scientific breeders are the outcome of centuries of selection and breeding with reference to certain desired qualities, such as strength in the draft horse, speed in the racer, richness and quantity of milk in dairy cattle, fineness of wool in certain sheep, and so on. The greatest progress in animal breeding has been made since the beginning of the nineteenth century. In the fifty years between 1850 and 1900, the average fleece of sheep in America increased in weight from 2.4 pounds per head to 6.2 pounds, through scientific methods. This example is typical of the development in all branches of the pure-bred livestock industry. Equally significant is the war on diseases and pests that attack farm animals. Eradication of the tick that transmits Texas fever of cattle has saved Southern livestock men untold losses. Vaccination, dipping, and other methods of controlling disease have been perfected, and information as to their application is available to farmers everywhere. In saving and guarding his crops and animals, the farmer has back of him the experience and aid of experts.

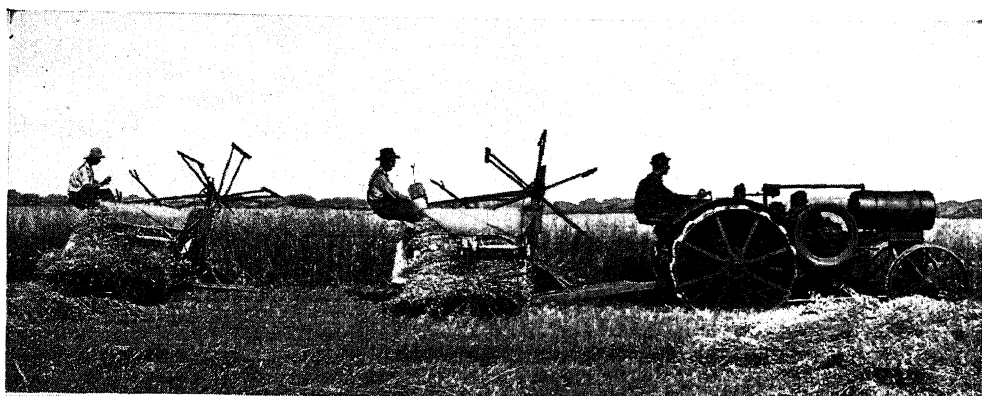
(5) **Education and Research.** No longer need farmers rely on guesswork and tradition in agricultural practices. The old hit-and-miss methods cannot compete with scientific agriculture based on experiments worked out by trained men under the auspices of the Depart-

ment of Agriculture and the state agricultural experiment stations. The farmer now may have his soil analyzed, and receive personal help and advice on plant and animal breeding, selection of seed, control of diseases and pests, and numerous other points. In both countries, state and provincial colleges of agriculture and associated experiment stations work in coöperation with the departments of agriculture. See AGRICULTURAL EDUCATION.

Transportation; Marketing. The past half-century has witnessed an extraordinary development of all forms of transportation and communication—railways, steamboats, interurban, and motorbus systems, automobiles and trucks, wire and radio communication, and the airplane. Those hardy pioneers who trekked to California in covered wagons, taking many weary weeks to cross the continent, and who waited long and patiently for news of the home folks, delivered by the "pony express," did not dream of the changes which less than a century would bring: railroads piercing the mountains through tunnels and carrying passengers from the Atlantic to the Pacific in less than a week; mail brought across the continent in flying machines in a little over thirty hours; horseless vehicles speeding along on hard roads where once the pioneer jolted painfully over rough trails or unbroken prairie; the voice of a radio announcer quoting prices of farm products, and heard instantaneously by listeners hundreds of miles from him and from each other. The tying up



Development of the Reaper. Above is an illustration of the first McCormick reaping machine. In the picture below, the farmer with four horses can do half as much work as the man with a tractor, shown at the top of the next page.



Photos: U & U; International Harvester Co.

Modern Harvesting Machinery. The tractor is a long step ahead of the horse-drawn reaper. In the center is shown a huge machine which reaps the wheat, thrashes it, and loads the grain into sacks—all in one operation. The man who drives thirty-two horses is probably the busiest person on the job. Below is a smaller combined harvester-thresher.

of widely separated communities by these modern forms of transportation and communication has vastly increased production of farm products. The fruit-grower of California and the potato-grower of Maine alike know that they can sell their product in cities a thousand miles away. In connection with this expansion there have arisen new problems of marketing and credit and the development of coöperative and rural-credit systems as permanent factors in American and Canadian agriculture (see articles on COÖPERATION; RURAL CREDITS).

Agriculture Round the World. Agriculture is the world's greatest occupation, measured by the number of countries in which it is the leading industry and by the number of persons in each country who follow it as a means of livelihood. More than three-fourths of all the people in the world are engaged in some form of agriculture. It is none the less true that the different nations are interdependent in regard to their food and clothing requirements. Except where living conditions are very simple, few countries produce enough to feed and clothe their own populations for any length of time. During the World War the effectiveness of the allied blockade, which cut off Germany from food and many common necessities shipped from overseas, was a strong factor in undermining the morale of the much-enduring German people. On the other hand, the submarine warfare on transport ships seriously hampered the allied countries in their efforts to feed their civilian and military populations. "Food will win the war" was a slogan that had a real basis of truth, and rationing was adopted very generally. In blockaded Germany, the scarcity of wool, cotton, and leather forced the people to wear all sorts of makeshift clothing and further taxed their patience.

Among all countries, the United States can best supply its domestic needs, but it does not grow certain elements in the diet that most persons look upon as necessities. These include such tropical products as tea, coffee, cocoa and chocolate, spices and condiments. Sugar is another product that is imported in very large quantities, for though cane is raised in Louisiana and sugar beets are grown in several Northern states, the country produces but one-fourth of its sugar requirements. It consumes practically all of Cuba's crop, besides drawing upon Hawaii, Porto Rico, the Philippines, and other tropical countries.

Of important clothing materials classed as agricultural products, cotton is the only one produced in abundance, with a surplus for export. There is no commercial production of raw silk, and little fiber flax is raised. Even the annual wool clip of about 300,000,000 pounds does not meet domestic needs, and as much more is imported. Clothing wool is ob-

tained from Great Britain, Argentina, Canada, Uruguay, Australia, and a few other countries. Japan and China, especially the former, supply American factories with the bulk of their raw silk, and flax fiber comes chiefly from European countries. If the United States were shut off from all imports, its people would not starve, but they would lack many of the commodities which add to the comfort of everyday living.

Conditions in Europe. The continent of Europe, with adjoining islands, has a total production of foodstuffs greater than that of the United States, but a larger population to feed. Though cereals, root crops, fruits, and vegetables are produced in immense quantities, and farm animals of every kind are raised, the density of population makes necessary large importations of foodstuffs. In Europe the farms are usually smaller than in America, and are more intensively cultivated. Before the World War many factors operated against the extensive use of farm machinery, and, with some exceptions, tended to retard the progress of the European farmers.

When the war broke out, the majority of European peasants who were tillers of the soil worked on the landed estates of aristocratic proprietors. This statement does not apply to Holland and the Scandinavian countries, nor to France and Germany, but it is particularly true of Russia and most of Central Europe. The post-war period has witnessed attempts to bring about changes in the agricultural situation in several countries. In Russia the peasants are cultivating small farms under conditions of perpetual leasehold, and the Soviet government has brought thousands of tractors into the country. In Rumania, Hungary, Poland, Czechoslovakia, and Yugoslavia, laws have been passed authorizing the partition of the large estates. This policy is as yet in the experimental stage. Its purpose is to create nations of small independent farmers. When the peasants have had time to learn and adopt advanced methods of farming, there should be a definite improvement in their own living conditions and an increased production of crops. See AGRARIAN LAWS (Modern Laws).

German farmers are among the most intelligent and industrious in the world, and their cultivation of unlikely bits of land always amazes the visitor. The terraced slopes of the Rhine, sites of flourishing vineyards, are a case in point. In Germany the scientific use of fertilizer is a notable factor in the agricultural progress of the country, which ranks first in the production of potatoes and sugar beets. In France there is also a thrifty and industrious farm population, and the country is well favored naturally. France is one of the leading wheat-producing regions of the world, and the southern part of the country yields fruit in variety and abundance. Both France and

Germany are nations of independent farmers. Italy is another country of good agricultural resources, with the land intensively farmed, and the lot of its tenant farmers has greatly improved under the vigorous rule of the Fascists.

In Great Britain the breeding of high-grade livestock has been the outstanding achievement in agriculture. From the Channel Islands of England have come the Guernsey and Jersey breeds of dairy cattle, and from Scotland the Ayrshire. England contributed the Devon, Hereford, and Shorthorn beef breeds, and Scotland the Aberdeen-Angus and Galloway. England produced the Shire horse; and Scotland, the Clydesdale. Numerous breeds of sheep and swine, most of them important in American livestock husbandry to-day, are also of British origin. In England and Scotland the percentage of pasture land is much greater than that of plow land, and the people are dependent on outside countries for much of their food. In England marked progress has been made in agricultural research and education since the war, and the land is scientifically cultivated by tenant farmers who remain on their holdings for a lifetime. Because of the high rates of taxation, many of the tenant farmers are in a better financial condition than the owners themselves.

Other Lands. In those parts of Asia where the cultivation of the soil is the chief task of a dense population, that is, in Southern and Eastern Asia, we find farm practices wholly different from American methods. In India the common people subsist almost entirely on rice and millet; these crops are raised on small plots cultivated intensively, but with the most primitive of tools. Were it not for the irrigation projects constructed by the British, India would undergo terrible famines whenever the rainfall failed. The country's most important crop for export is cotton, the yield of which has been greatly increased through irrigation.

In the neighboring country of China, the farmers are the most stable element in that republic of endless revolution. The rural districts are heavily populated, and the tillable land could not support the masses of country folk were it not for the intense industry, personal economy, and skilful management of the Chinese farmer. Not an inch of soil is wasted, human labor is given unsparingly, and human and animal wastes are carefully saved for use as fertilizer. The farmer tills the soil with spades, rakes, and hoes; he flattens the earth with stone rollers, drawn by man power; and he plows with an iron-shod implement light enough to be carried home on the shoulder. Water buffaloes, oxen, donkeys, mules, bullocks, and the men themselves are used as draft animals. Weeding, sowing, transplanting, reaping, and thrashing are all done by hand or

with hand tools, and the women and children give their services in all of these undertakings. Tea and silk are the two leading money crops of the country, but rice is the staple food of the Chinese people. They also raise vegetables, fruits, millet, and other grains.

The Japanese, like the Chinese, make the most of every available bit of soil, work their small plots intensively, are accustomed to hard labor, and use human waste for fertilizer. There are fewer domestic animals than in China, for there is little room for grazing. Cheap rice imported from India, and fish caught in waters adjacent to Japan, constitute the chief food of the people. While some rice is exported to America, the United States is beginning to compete with China and Japan in the production of this cereal, owing to its more economical methods of culture.

The most interesting country in Africa, from the standpoint of agriculture, is Egypt. In this almost rainless country the silty waters of the Nile flood the valley plains once a year, permitting the farmer to sow and harvest his food crops of sweet potatoes, green corn, and beans with little effort. The farmers use the same methods and implements that were employed in Bible times, but so fertile is the soil that they find these antiquated practices effective. The Egyptians had been practicing a rather simple form of irrigation for centuries when, in 1902, the British erected a great dam at Assuan and inaugurated a system of perennial irrigation. When watered artificially, the land produces several crops a year, and makes possible a population of 1,100 to the square mile. All of the cultivable area lies between the Arabian and Libyan deserts, and covers not much over 12,000 square miles. Within recent years, cotton has become an important money crop. Great Britain has initiated a policy of increased production, whereby, it is hoped, the cotton for British manufacture will be supplied largely from Egyptian sources.

Among other countries, Australia and New Zealand stand out because of their production of high-grade wool, their rapidly developing dairy, beef, and mutton industries, and their profitable yield of wheat. All of these commodities are produced in quantities sufficient to allow a surplus for export. In South America, Argentina is raising wheat and corn for export, and its wool, mutton, and beef products are important items in the trade of the world. The neighboring republic of Brazil supplies Canada and the United States with practically all of their coffee, and is one of the chief producers of cocoa and chocolate, obtained from the cacao tree. C.F.C.

Related Subjects. Those who wish to make a systematic study of agriculture are referred to the topics below, each of which will be found in its alphabetical order in these volumes. The topics are arranged in groups according to their relations (see page 104).

OUTLINE AND QUESTIONS ON AGRICULTURE

Outline

I. What It Is

- (1) Cultivation of the soil
- (2) Care and use of plants and animals

II. Early History

- (1) Earliest efforts to obtain food
 - (a) Dependence on Nature
- (2) Domestication of animals
 - (a) For food and labor
- (3) Selection of food plants
 - (a) First cultivation of the soil
- (4) The first farm tools
 - (a) Invention of the plow

III. Importance

- (1) Practically all foodstuffs produced by it
- (2) Almost all clothing materials
- (3) Agricultural industries

IV. The New Agriculture

- (1) Implements and machinery
- (2) Crop rotation
- (3) Commercial fertilizers
- (4) The rôle of bacteria
- (5) Plant breeding
 - (a) Improvement of old species
 - (b) Creation of new varieties
- (6) Control of insects and diseases
 - (a) Use of sprays
- (7) Animal breeding
 - (a) Improved breeds of livestock
- (8) Control of animal diseases
 - (a) Vaccination; dipping, etc.
- (9) Educational research
 - (a) Work of agricultural departments
 - (b) Agricultural colleges
 - (c) Experiment stations
- (10) Transportation and marketing
 - (a) Railroads, steamboats, motor vehicles, the aeroplane
 - (b) Wire and wireless communication
 - (c) Cooperation; rural credits

V. Agriculture Round the World

- (1) The world's leading occupation
- (2) The nations depend on one another
 - (a) America imports tea, coffee, spices, etc.
 - (b) Wool, flax, and raw silk imported
 - (c) Has surplus food for export
- (3) Conditions in Europe
 - (a) Imports of food supplies necessary to feed population
 - (b) Change in status of European peasants
 - (c) Industry and thrift of German and French farmers
 - (d) Pure-bred livestock of the British Isles
- (4) India
 - (a) Intensive cultivation of small plots
 - (b) Primitive tools
 - (c) Effect of irrigation
- (5) China
 - (a) Industry and skill of farmers
 - (b) Fertilization methods
 - (c) Tillage methods
 - (d) Human and animal power
 - (e) Products
- (6) Japan
 - (a) How the people live
- (7) Egypt
 - (a) The help of the Nile
 - (b) Antiquated methods
 - (c) Irrigation
 - (d) Density of population
- (8) Australia
 - (a) Animal products
 - (b) Wheat
- (9) Argentine Republic
 - (a) Export of grain
 - (b) Wool and beef
- (10) Brazil
 - (a) World's leading coffee region
 - (b) Cocoa and chocolate

Questions

How does agriculture rank in importance among the industries?

Can you think of any common article of food with the production of which the farmer has nothing to do?

Are the textile industries as dependent upon the farmer's activities as are those connected with food?

What is that branch of agriculture called which has to do with the raising of fruit?

How are the birds of use to the farmer?

What is a silo? Has it played a very large part in recent agricultural development?

What are the principal grains?

In what parts of North America is flax grown?

How does agriculture rank in importance among the industries?

Trace the steps in the development of the plow.

OUTLINE AND QUESTIONS ON AGRICULTURE—Continued

Questions

If the farmer of thirty years ago could visit a fully equipped modern farm, what are some of the things he would see which would amaze him?

Is it of any advantage to the farmer to understand the principles of chemistry?

What change has there been in the attitude of the farmer toward agricultural education?

What is an agricultural experiment station?

What is meant by the statement that "agriculture has become a science as well as an art"?

What enemy does the grower of cotton most dread? The grower of wheat?

What insecticides can the farmers use to rid themselves of these pests?

Name some of the principal forage crops of Canada and the United States.

What conditions are necessary to the growing of rice?

What is meant by intensified farming?

In what way can clover benefit the soil?

Is the earthworm a hindrance or a help to the farmer?

Make a list of the various kinds of soil.

Describe briefly three great irrigation projects.

In what way are school gardens helpful?

How can you recognize an apple tree when it is bare of leaves? A cherry tree?

Should a farmer shoot robins?

What is a weed? Name several of the most troublesome, and tell how they should be dealt with.

How do the departments of agriculture of Canada and the United States stand ready to assist the farmers?

What are consolidated schools? Of what help are they to the community?

How does the winter life of a farmer's family of to-day differ from winter life on a farm a score or more of years ago?

With the aid of the indexes and articles in these volumes, answer the question which troubled John and Mary—where does bread come from?

What is meant by dry farming?

In what part of the United States and Canada is dry farming practiced?

How can a farmer be absolutely certain as to which of the crops he is raising are profitable?

Under what headings would a farmer open his various accounts?

About how much rainfall must a region have in order that ordinary farming may be profitable?

What do you understand by grafting?

What has been accomplished by canning clubs?

Why is Luther Burbank called the "plant wizard"?

Name some of the cattle diseases the stock-grower has to combat.

Explain and justify the statement that the farmers are the founders of civilization.

What progress in farming was made by the American Indians?

If the United States were shut off from all imports, what articles of food and clothing would you have to do without?

Why are primitive tools and farming methods successful in Egypt?

What use do American farmers make of windmills?

What is the importance of crop rotation?

Why do modern farmers have to buy fertilizer?

How do Chinese and Japanese farmers fertilize the soil?

What countries supply us with tea, coffee, cocoa, and chocolate?

What breeds of livestock originated in England?

FARM EQUIPMENT

Binder Twine	Pump
Churn	Reaping Machine
Cotton Gin	Silo and Silage
Cream Separator	Sowing Machine
Gas Engine	Thrashing Machine
Mowing Machine	Traction Engine
Plow	Windmill

THE SOIL AND ITS MANAGEMENT

Drainage	Irrigation
Dry Farming	Loam
Fertilizer	Manures
Guano	Phosphates
Gypsum	Rotation of Crops
Intensive Farming	Soil

CROPS

Alfalfa	Jute
Barley	Kafir Corn
Buckwheat	Millet
Clover	Nut (see below)
Corn	Oats
Cotton	Rice
Flax	Rye
Fruit (see list below)	Sorghum
Grasses (with list)	Sugar Cane
Hay	Tobacco
Hemp	Vegetables (see below)
Herbs	Wheat

FRUITS AND NUTS

Almond	Date	Pawpaw
Apple	Fig	Peach
Apricot	Gooseberry	Peanut
Avocado	Grape	Pear
Banana	Grapefruit	Pecan
Bergamot	Guava	Persimmon
Bitternut	Hazel	Pineapple
Blackberry	Hickory	Pistachio
Brazil Nut	Huckleberry	Plum
Breadfruit	Kumquat	Pomegranate
Butternut	Lemon	Prickly Pear
Casaba	Lime	Prune
Cherry	Loganberry	Quince
Chestnut	Loquat	Raisins
Citron	Mango	Raspberry
Coconut	Melon	Strawberry
Crab Apple	Muskmelon	Tangerine
Cranberry	Nectarine	Walnut
Currant	Olive	Watermelon
	Orange	

VEGETABLES

Artichoke	Eggplant	Parsnip
Asparagus	Endive	Pea
Bean	Garlic	Potato
Beet	Gourd	Pumpkin
Brussels Sprouts	Gumbo	Radish
Cabbage	Kohl-rabi	Rhubarb
Carrot	Leek	Spinach
Cauliflower	Lentil	Squash
Celery	Lettuce	Sweet Potato
Chard	Okra	Tomato
Cress	Onion	Turnip
Cucumber	Oyster Plant	Yam
	Parsley	

INSECT ENEMIES

Aphides	Corn Borer	Pink Bollworm
Army Worm	Corn Earworm	Phylloxera
Bean Beetle	Curculio	Potato Bug
Beetle	Cutworm	Rose-Chafer
Boll Weevil	Fruit Flies	San Jose Scale
Brown-Tail Moth	Grain Weevils	Scale Insect
Cankerworm	Grasshopper	Tent Caterpillar
Caterpillar	Gypsy Moth	Tussock Moth
Chinch Bug	Hessian Fly	Weevil
Cicada	Locust	Wireworm
Codling Moth	Peach Moth	

PLANT DISEASES AND PARASITES

Blight	Mildew	Rusts
Dodder	Mold	Smuts

CONTROL OF PLANT ENEMIES

Herbicides	Insecticides and Fungicides
Paris Green	

STOCK AND POULTRY RAISING

Breeding	Fowl	Incubator
Cattle	Goat	Poultry
Cow	Goose	Sheep
Duck	Hog	Turkey
Egg	Horse	

THE DAIRY INDUSTRY

Butter	Cheese	Dairying
Buttermilk	Creamery	Milk

ANIMAL DISEASES AND PESTS

Anthrax	Lumpy Jaw
Botfly	Mange
Distemper	Mites
Flea	Parasite
Foot and Mouth Disease	Rinderpest
Gapes	Spavin
Glanders	Tick
Heaves	

See, also, VETERINARY MEDICINE.

EDUCATION AND RESEARCH

Agricultural Education
Agricultural Experiment Stations
Agricultural Extension Work
Agriculture, United States Department of
Boys' and Girls' Clubs
Canning Clubs
County Agent
Farmers' Institute

UNCLASSIFIED

Agronomy	Hotbed
Bee	Nomad Life
Birds (Relation to Man)	Pruning
Gardening	School Garden
Grafting	United States (Wealth in Farms)
Greenhouse	
Horticulture	

AGRICULTURE, UNITED STATES DEPARTMENT OF. The agricultural interests of the United States were first officially recognized by the government in 1836, when the Commissioner of Patents began in a small way to supply farmers with seeds. The purpose of seed distribution was commendable, for new and valuable plants were needed in many districts, and there were no local experiment stations to encourage their development. By 1862 the necessity for more definite and systematized assistance was seen, and in that year the Bureau of Agriculture was established; the work was transferred from the Patent Office and became a branch of the Department of the Interior, with the Commissioner of Agriculture in charge. In 1862 Congress also passed the Morrill Act providing endowments for agricultural colleges through the sale of public lands (see AGRICULTURAL EDUCATION). Since that date the government has kept in close touch with the farming interests of the entire country.

In 1889 the Bureau of Agriculture was

raised to the rank of an executive department known as the Department of Agriculture, and its head was given a place in the President's Cabinet, with the title Secretary of Agriculture. This official thus became the eighth member of the Cabinet. The first secretary was Norman J. Colman, who had been Commissioner of Agriculture. The fourth secretary, James Wilson, of Iowa, was appointed by President McKinley in 1897, and remained in the office until March, 1913, a period of sixteen years. He served under four Presidents in succession.

The activities of the department have multiplied to such an extent since 1889 that changes in organization have been made from time to time, in the interest of greater efficiency and better service. As organized at present, the department comprises the following bureaus and divisions:

1. **Weather Bureau:** conducts investigations in meteorology and climate; forecasts weather from twenty-four hours to three days in advance; warns of floods and announces coming storms. See WEATHER BUREAU.

2. **Bureau of Agricultural Economics:** studies the various factors affecting farmers' incomes and profits; shows farmers how best to apply principles of buying and selling.

3. **Bureau of Animal Industry:** studies animal diseases and means of combating them; investigates animal breeding and feeding; inspects imports and exports; supervises interstate shipment of cattle, and examines slaughterhouse products.

4. **Bureau of Plant Industry:** conducts researches in every department of botany; reports on the history, distribution, and utilization of forage plants; investigates varieties of fruits and grains with respect to their adaptation to particular soils and climates; collects seeds from every part of the world for testing at the experiment stations; purchases and distributes seeds annually through Congressmen (although this practice may be soon abandoned). It also studies and experiments with rotation of crops.

5. **Forest Service:** devotes particular attention to the conservation of forests, and the most economic use to which forests and forest products can be put. See FORESTS AND FORESTRY.

6. **Bureau of Chemistry and Soils:** conducts researches in chemistry, as related to agriculture, particularly with foods, fertilization, and soils; analyzes foods and drugs designed for human use. The division devoted to soils, particularly, conducts studies in physics as related to agriculture; surveys, locates, and maps various kinds of soil; searches for new supplies of fertilizer and cheaper methods of production.

7. **Bureau of Entomology:** studies the history and distribution of insects; determines which are beneficial, and investigates means of extermination of those which are injurious.

8. **Bureau of Biological Survey:** reports on geographic distribution of plants and animals, furnishing maps of zones; investigates the food and food habits of birds and animals; introduces desirable birds and animals into localities where they have not before been known.

9. **Bureau of Public Roads:** conducts experiments in road making and reports on economic features of road management; coöperates with the states in building hard roads; aids farmers in planning drainage systems; gives advice on irrigation problems; gives farmers help in building houses and barns, and installing house conveniences; carries on drainage of swamp areas. See ROADS AND STREETS.

10. **Bureau of Home Economics:** investigates and reports on best ways of making rural home life satisfying; suggests ways of giving the home a place of influence in the community; teaches the art of right living.

11. **Bureau of Dairy Industry:** investigates and reports on better methods of feeding and breeding dairy cows, of making dairy products, and of handling market milk.

12. **Office of Experiment Stations:** gives to the public the results of the work of experiment stations; a clearing house of agricultural knowledge. See AGRICULTURAL EXPERIMENT STATIONS.

13. **Office of Coöperative Extension Work:** a center from which suggestions, information, and inspiration are sent out to all of the states, in the interest of agricultural extension. See AGRICULTURAL EXTENSION WORK.

14. **Library:** a repository of valuable books, pamphlets, and bound periodicals relating to agriculture.

15. **Federal Horticultural Board:** enforces the plant quarantine laws, intended to keep out of the country undesirable plants harboring diseases and pests; inspects carriers and containers of imported plants; supervises the disinfection of railway cars and freight and luggage of all kinds; orders quarantine within the country and stops interstate commerce, when such measures are deemed necessary.

16. **Food, Drug, and Insecticide Division:** makes known the best methods of destroying insect pests and plant diseases; standardizes and investigates all chemical preparations offered farmers, whether for killing insects and plant diseases or for disinfecting animals; recommends the prosecution of manufacturers who mislabel or adulterate their products in defiance of the law. In meat-packing, this division establishes supervision over the business of meat-packing houses and all agencies handling cattle, hogs, and sheep in interstate commerce, to eliminate deceptive and illegal practice. The meat-packing division was formerly called Packers' and Stockyards' Administration.

17. **Grain Futures Administration:** exercises supervision over trading in "futures" on boards of trade, forestalling attempts to "corner" the market or send out misleading information to influence prices of cereals.

The department prints and distributes yearly an immense number of periodicals, bulletins, and circulars, and the value of the information made available in this manner is beyond estimate. Formerly, this work was in charge of a Division of Publications, but during the term of Secretary Wallace (1921-1924) a central editorial office was established to handle all publication service of the department. The head of this service is the Director of Information. The Secretary of Agriculture shares his executive duties with an Assistant Secretary, and the various offices

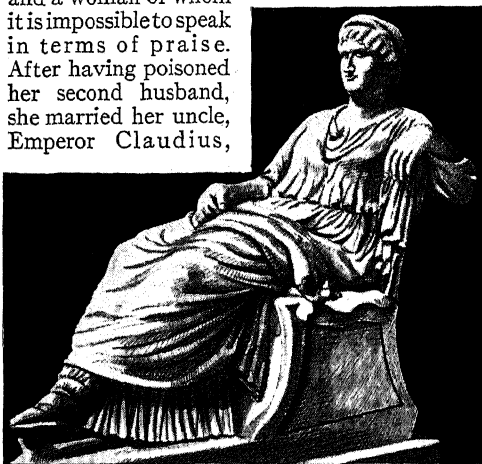
and bureaus, besides having their respective chief officers, are under the general supervision of the Directors of Scientific Work, of Extension Work, and of Regulatory Work. There is also a Director of Personnel and Business Administration. The legal work is in charge of a Solicitor, who is assisted by a large corps of lawyers. C.F.C.

AG'RIMONY, the common name of a genus of perennial plants occurring in many parts of America as wayside and woodland weeds. They possess deeply indented, downy leaves and small yellow flowers at the end of a tall stalk. The calyx tube forms a cone-shaped fruit, or bur, with hooked bristles; in sheep-growing regions the plants are a nuisance, because the burs cling to the fleece of the grazing animals. Destroying the burs before new plants form is the best method of controlling agrimony. The plants are further characterized by an aromatic odor and bitter taste. An infusion of dried agrimony leaves has been used as a gargle in some forms of throat trouble. B.M.D.

Classification. The scientific name of the genus is *Agrimonia*; it belongs to the rose family, *Rosaceae*.

AGRIP'PA. See PAUL (the Apostle).

AGRIPPI'NA (A.D. 16-59), called **AGRIP'PINA THE YOUNGER**, was the mother of Nero, and a woman of whom it is impossible to speak in terms of praise. After having poisoned her second husband, she married her uncle, Emperor Claudius,



AGRIPPINA THE YOUNGER

The sculptor is unknown, but the work has been identified, to the satisfaction of historians, as a statue of the mother of Nero. (In the National Museum, Naples.)

whom she induced to disinherit his own son in favor of her son Nero. She then poisoned Claudius, placed Nero on the throne, and prepared to govern through him, but he proved to have a strong will of his own. When she plotted against him, he had her put to death. See **NERO**.

AGRONOMY, a *gron' o mie*. The future

welfare of the world's population is dependent on an adequate food supply. Population continues to increase at a more or less constant rate; food production has likewise been on the increase, and in civilized nations famines are virtually unknown. Periods of over-production and low farm prices are not uncommon in this generation. Even though the average man gives little thought to the food problem as it may ultimately affect the happiness and the progress of future generations, nevertheless the line representing population increase and that marking the rate of increase in food production are approaching each other. Ultimately, the density of population will be determined by our ability to produce food.

Agronomy Defined. Agronomy is that division of agricultural science dealing with the production of the staple food and fiber crops. The soil is our greatest single natural resource. The agronomist is concerned with its efficient utilization in the production of grain, hay, pasture, and fiber crops. He is likewise interested in its preservation, in order that future generations may be adequately fed and clothed.

As a science, agronomy has to do with the fundamental factors which influence the production of corn, wheat, hay, cotton, flax, and other field-grown food and fiber crops. As an applied science, it furnishes the farmer the necessary information concerning soil management and crop production, to enable him to produce not only efficiently and economically, but permanently.

Crop Production. The productivity of the soil, which is measured by the yield of crops, depends on such factors as a proper moisture supply, an adequate amount of available plant food, and a degree of acidity or alkaline content best suited to the character of crops grown. Yields are also influenced by certain negative factors such as weeds, insect diseases, and the accumulations of alkali salts. They are also dependent on the adaptability of the crop to the environment, the variety or strain of seed used, and the cropping system followed.

The control of soil water has necessitated the artificial drainage of large areas of farm land. Food production may be greatly increased by the more efficient drainage of much land now cropped, as well as by the artificial drainage of thousands of square miles of swamp and marsh lands. In arid and semi-arid sections, irrigation and improved methods of dry-land farming have materially aided in crop production. Alkali injury in these dry sections has been reduced. The annual loss resulting from soil erosion is enormous. This destructive effect of excess rainfall must be more effectively controlled as a contributing factor in soil conservation.

Throughout sections with an annual rainfall of thirty inches or more, soils have become acid in character. In the United States, this region includes areas in the Southern, Central, and Eastern states. Lime has been found essential for acid soils, and liming, particularly for clover and alfalfa, has become a common practice.

The yield of field crops is dependent to a large extent on the supply of available plant-food. Soils are seldom supplied with adequate amounts of all the nutrients required for the growth of crops; nitrogen and phosphorus are commonly deficient, and potash may also be needed. These three elements constitute the modern commercial fertilizer. The nitrogen needs of field crops may be economically supplied by the growing of legumes such as clover, alfalfa, beans, and peas, in rotation with the grain and fiber crops. These legumes utilize the nitrogen of the air and leave in the soil an increased available supply for the following crop. Animal manures also furnish much nitrogen. Phosphorus and also potash, when deficient, must be supplied as commercial fertilizers.

Crop Improvement. The agronomist has made valuable contributions in improved varieties and strains of crops. High-yielding varieties of the numerous grains have been produced, drought- and disease-resistant strains have been developed, and hardy types of cereals, cotton, and alfalfa have greatly widened the territory in which these crops can be economically produced. Much has been accomplished with the help of entomologists, bacteriologists, and plant pathologists in devising practical methods of disease and insect control. Valuable contributions have been made by the manufacturer of farm machinery for the perfection of tillage implements and harvesting machines. Improved methods of soil tillage, resulting in better seed-bed preparation and more efficient weed control, have been developed for the farmer.

The agronomists' future responsibility is the efficient and adequate production of food. Additional knowledge, which can be secured by soil and crop field surveys, by laboratory research, and by field experimentation, will be needed. The available information must be carried to the farmer by means of more effective extension teaching, so that field practices in soil management and crop production will be constantly improved. Emphasis must be placed on economic production, in order that the staple food products will be produced at the lowest cost. Finally, the agronomist must assume the additional responsibility of conserving the natural soil resources for future generations. See AGRICULTURE; AGRICULTURAL EDUCATION; AGRICULTURAL EXPERIMENT STATIONS. E.L.W.

AGUA CALIENTE, *ah'gwah kahl yen' ta*. See MEXICO (Principal Cities).

AGUE, *a' gu*. See MALARIA.

AGUINALDO, *ah ge nahl' do*, EMILIO (1870-), a notable character at the age of twenty-nine, in connection with American occupation of the Philippine Islands. He was the leader of stubborn resistance to United States authority, which ended only with his capture by Colonel, later Major General, Frederick Funston (which see).

Aguinaldo had a varied career up to 1898, the year the islands became an American possession. His parentage was unknown. He was reared by a priest and received a good education, intending to become a physician. Before he was twenty, he was obliged to leave home to escape arrest on a minor charge by the Spanish, and in Hong Kong learned some of the methods of European warfare. For a time the adventurous youth is said to have served in the Chinese navy. When Dewey's fleet ended Spanish authority in the Philippines, he returned home, with the good intention of aiding the American authorities. However, he was offended because he was not recognized at his own appraised value, and within a year headed a very formidable revolt against the Americans. His forces were driven to the mountains, where, for two years, resistance continued.

Aguinaldo was well treated after his capture, became reconciled to those in authority, and set a good example to his followers by becoming a useful citizen. His daughter was educated in America. See PHILIPPINE ISLANDS (History: The Awakening).

AGULHAS, *ah guhl' yahs*, CAPE, the southernmost point of Africa, about one hundred miles east and south of the Cape of Good Hope. See map, AFRICA.

AHAB, the seventh king of Israel, who, influenced by his evil wife, Jezebel, set up the worship of Baal and cruelly persecuted the true prophets. He reigned from about 875 to 853 B.C., and was bitterly opposed by the prophet Elijah. His history is told in the last seven chapters of *I Kings*. See JEHU; ELIJAH; BAAL.

Jez'ebel, the cruel and heartless daughter of King Ethbaal of Tyre, and wife of Ahab, king of Israel. Her marriage with the latter was for the purpose of allying the two countries, and she won the disfavor of the people when she established her own form of worship at her husband's court. She opposed Elijah, the prophet, who bitterly denounced her, and she was accused of attempting to cause the death of certain other prophets. By her orders Naboth, a neighbor, was stoned to death for refusing to sell his vineyard to King Ahab (*I Kings* XXI, 1-13). Jezebel herself was finally murdered by Jehu (*II Kings* IX, 30-37), fourteen years after her husband's death.

AHASUERUS, *a haz u e' rus*, in Bible narrative a king of Persia, to whom the beautiful

Queen Esther made her appeal to save the Jews from the wicked plot of Haman. Around these characters centers one of the most appealing stories of the Bible, found in the book of *Esther*. This king is thought to have been Xerxes I. Ahasuerus is also a Scripture name for Cambyses, the son of Cyrus (*Ezra* iv, 6), and for Astyages, king of the Medes (*Dan.* ix, 1). See *ESTHER*; *HAMAN*.

A'HAZ, son of Jotham, was the twelfth king of Judah and ruled from 736 to 728 B.C. His reign was marked by a return to idolatry, and at his command the Temple was plundered to secure presents for Tiglath-Pileser (which see), the king of Assyria, whose aid had been sought against the Syrians (*II Kings*, xvi). See *TEMPLE*.

AHRIMAN, *ah'-ri man*. See *ZORO-ASTER*.

AI, *ah' e*. See *SLOTH*.

AIDA, *ah e' dah*. See *OPERA* (Some of the Famous Operas).

AID-DE-CAMP, *aid de kamp'*, or *aid - de - kaN'*, an officer who serves on the staff of a general, and assists him in the details of his military and social duties. In time of war, the duties are arduous and dangerous, and the successful aid must be alert, resourceful, and prompt. Modern warfare has considerably changed the duties of aids-de-camp. The automobile, the telephone, and the wireless telegraph facilitate sending of orders, but the duties of the aid still take him constantly into the zone of danger. The position carries military and social prestige, and is eagerly sought by young officers. See *ARMY*. **AIGRETTE**, *a gre'*. See *EGRET*, subhead; *FEATHERS*.

AIKEN, CONRAD. See *AMERICAN LITERATURE* (The More Recent Poets).

AILANTHUS, *a lan' thus*, an ornamental tree, native to China and naturalized in Europe and parts of North America. It is popular as a shade tree because of its wide-spreading branches and its habit of growing rapidly. The ailanthus, also called *tree of heaven*, is easily recognized. It has brownish-gray

bark, coarse, blunt twigs, and long, narrow leaves that are composed of numerous sharp-pointed leaflets. Its average height is about fifty feet, but some specimens grow half as tall again.

The small, yellowish-green flowers are borne in loose clusters on the ends of the stems. The seeds, three to five of which develop to each flower, have wings much like those of the maple and ash, and are hence adapted to wind dispersal [see *SEEDS* (Seed Dispersal)]. The staminate blossoms have a very disagreeable odor, as do the twigs when crushed. Ailanthus trees spread readily by suckers,

and they adapt themselves quickly to almost any situation. They are of practically no use as timber trees, because their wood is quite soft and weak. G.M.S.

Scientific Name. Theailanthus belongs to the quassia family, *Simarubaceae*. Its botanical name is *Ailanthus glandulosa*.

AILERON, *a' le-ron*. See *AIRCRAFT* (Aircraft Heavier than Air).

AINO, *i' no*, OR **AINU**, *i' noo*, the name of a hairy, brown, short-statured race which peoples the island of Yezo, the Kurile islands, and parts of Saghalien, and is perhaps the race first occupying Japan itself. The

Ainos, who number about 20,000, are yet in the stage of lower civilization or higher barbarism (see *CIVILIZATION*). The men's hair is seldom cut; they wear great, bushy whiskers, and their bodies are very hairy. They resist modern influences. Their religion, in which a sort of bear-worship figures, in some respects resembles that of the American Indians. They are said to average less than five feet in height.

Tradition. The name may have been derived from *inu*, meaning *dog*, a term applied to Ainos in contempt by the Japanese, who in early days drove them northward, or it may have come from an aboriginal leader named *Aiona*, their reputed ancestor. C.W.

AIR, the element in which human beings and plants and animals live and breathe, is an invisible mixture of gases which can be weighed,



Photo: U & W

THEY REFUSE TO BE MODERNIZED

The men pictured above are typical of the unbarbered, semi-civilized Aino race.

expanded, or compressed, transformed into a liquid, or even frozen into a solid. *Atmosphere* is another name for air.

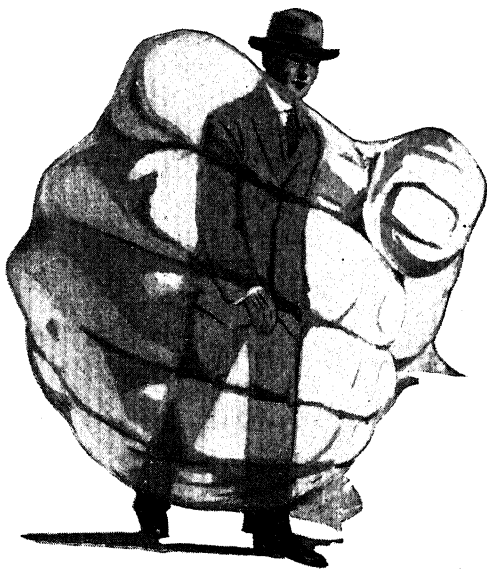
Weight. That air has weight was observed by Galileo, about 300 years ago, from the operation of a pump which sucked water in the same manner as an ordinary kitchen or well pump of to-day. When you press the handle of the pump, you pull the air out of the pipe. The water in the cistern or well is weighed down by air and forces the water in the pipe, which is bearing no weight, to rise. Torricelli, a pupil of Galileo, proved that the weight of the air over a square inch of surface equals that of a column of mercury about thirty inches high. At the sea level, one square inch sustains the weight of about 14.7 pounds of air, but at higher points in the atmosphere, the pressure is less (see below). It also varies with the state of the weather, and Torricelli's apparatus has become the barometer of to-day, an instrument which enables weather observers to foretell storms. The entire atmosphere about the earth is estimated to weigh about 60 million billion tons.

Weight, we know, is a universal property of matter, inasmuch as all matter is under the influence of gravitation. Therefore, as air has weight, it must be made up of particles of matter. Under pressure, these particles come closer together, so the air at the earth's surface is more dense than that higher up. About thirty-three miles above us, the particles are so far apart that the air has less than $1/7000$ as much density as at sea level. Just how far from the earth there ceases to be any air we do not know. We are sure, however, that there is some at heights of 100 to 200 miles, because about that distance away pieces of matter falling toward the earth are set on fire by friction and become meteors, the so-called *shooting stars*. At even higher altitudes, there is enough air to make visible the Aurora Borealis.

Buoyancy. As the tendency of air is to expand, any portion of it presses upward against the weight of the air above. Normally this upward pressure exactly equals the downward pressure at the same point. If it were less, the air would be further compressed; if it were greater, it would expand. For the same reason, the pressure is equal in all directions. Without this elastic upward pressure you could not in the open air turn the leaf of this book, for the weight of the air upon it would be nearly half a ton.

If any object is lighter than the air which it displaces, its downward pressure, due to gravity, is less than the upward pressure of the air underneath it, and it rises. Thus a balloon filled with light gases ascends till it reaches a point where it equals in weight the rarer atmosphere it displaces.

An opened newspaper floats gently to earth, while the same paper, folded, falls rapidly. In the first instance, the downward force of its weight is distributed over a larger surface,



ILLUSTRATING ATMOSPHERIC PRESSURE

Everyone knows that air exerts a downward pressure. Not all may realize, however, that the air is also pressing on the body from all sides, for pressure is equal in all directions. The outline of the hand suggests the squeezing that the air exerts on the body. We do not feel the effect because air inside the body is exerting an equal pressure toward the outside. When persons ascend to great heights they sometimes have a roaring sound in the ears or suffer other effects because of the unequal pressure due to the rarefied condition of the upper air.

thus reducing the pressure, which drives the air from under the paper in order that it may fall. In a vacuum, all things fall with equal rapidity, and only in a vacuum can objects be accurately weighed.

What the Air Is Made of. The proportion of gases in the air varies with place and height. About seventy-nine per cent is nitrogen, nearly twenty-one per cent, oxygen. Water vapor, carbonic-acid gas, traces of ammonia, ozone, argon, helium, neon, krypton, xenon, and minute particles of animal, vegetable, and mineral matter form the very small remainder. Because plants absorb carbonic-acid gas and return oxygen to the air, while men reverse this process, city air has less oxygen than country air. Coal, oil, natural gas, and other substances in the earth which have been formed by plants or animals formerly living on it, contain gases extracted from the air, so there is probably slightly less atmosphere around the earth than there was thousands of years ago. During the age when coal was formed, the atmosphere must have contained large quantities of car-

Domain of the Birds



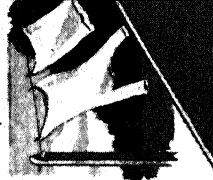
Most Fish possess an Air Bladder



Cushioning



Drying
Cooling



Military Music



Orchestra Music

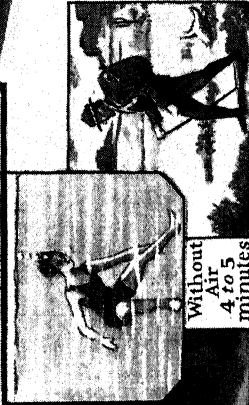
Dance Music

Without food 40 to 60 days

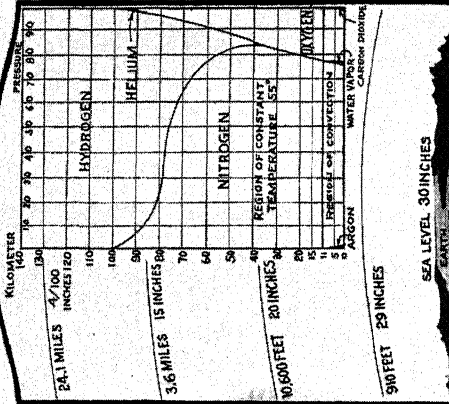
Without Air 4 to 5 minutes

Without water 72 hours

Human beings can live



AIR in Relation to LIFE and INDUSTRY



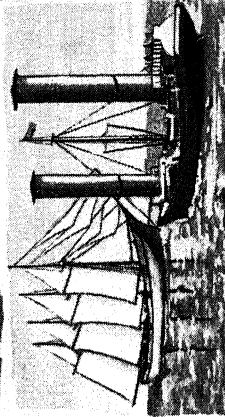
Paint Spraying



Suction



Applied Power



Sailing ship propelled by air pressure against sails... Rotor ship propelled by air pressure against rotating cylinders

Percussion



bonic-acid gas. But during historic times there is no evidence that the constitution of the air has undergone any change.

What the Air Does for Us. Besides supplying oxygen for us to breathe, the air in other ways enables us to live. It absorbs heat from the sun and prevents the earth from losing its heat so rapidly during the hours of darkness; without an atmosphere, the earth would be burning hot by day and intensely cold by night. Air is also a medium for sound waves, which, unlike light, travel only through material bodies. It turns our windmills; makes air brakes possible; we ride on air in automobiles; we have many machines which operate by compressed air; the housewife uses air in vacuum cleaners to make her work less tiresome.

A.L.F.

Problems. 1 Under ordinary conditions at sea level, 1 cubic foot of air weighs 0.076 pound. What is the height of a square room containing 393.984 pounds of air if its walls are 24 feet wide?

SOLUTION: 0.076 pound = weight of air in 1 cubic foot of space.

$\frac{393.984}{0.076}$, or 5,184, = number of cubic feet of space containing 393.984 pounds of air.

Area of room = (24 × 24) square feet, or 576 square feet.

Height of walls = $\frac{5,184}{576}$ feet, or 9 feet.

2. Assuming that the weight of a liter of air is 1.2 grams, find the weight of the air in a room 3 meters high, 12 meters long, and 10 meters wide.

SOLUTION. Volume of room = (3 × 12 × 10) cubic meters = 360 cubic meters.

1 liter = capacity of a cube with a volume of 1,000 cubic centimeters; that is, 1 cubic meter = 1,000 liters (see METRIC SYSTEM).

Then 360 cubic meters = 360,000 liters.

If 1 liter of air weighs 1.2 grams, 360,000 liters of air will weigh 360,000 × 1.2 grams, or 432,000 grams, or 432 kilograms, or .432 ton.

3. For places not far above sea level, the decrease in atmospheric pressure is about 0.1 inch for every 90 feet of ascent. During a certain mountain climb, the barometer fell 1.8 inches. What was the height of the climb in feet?

SOLUTION: $\frac{1.8}{0.1} = 18$ = number of units indicated

by fall of the barometer.

18 × 90 feet = 1,620 feet, height of the climb.

Related Subjects. The reader is referred in these volumes to the following articles:

Air Brake	Compressed Air	Nitrogen
Air Pump	Dust, Atmospheric	Oxygen
Aurora Borealis	Gallio	Torricelli
Barometer	Liquid Air	Vacuum
Carbonic-Acid Gas	Meteor	Wind

AIR, COMPLEMENTAL. See BREATH AND BREATHING (Lung Capacity).

AIR BRAKE, a device which uses the power of compressed air to stop railway trains or regulate their speed. Before the invention of the air brake, the only way of bringing a train to a stop was by the hand brake attached to

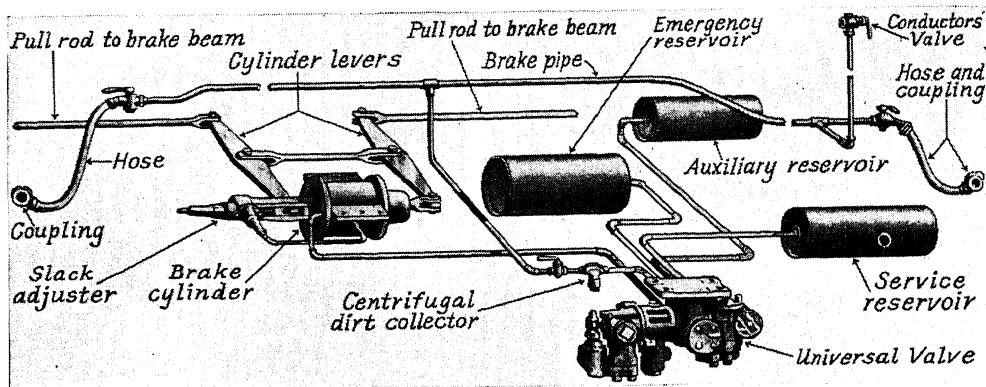
Outline for the Study of Air

1. What air is
2. Weight
 - (a) How discovered
 - (b) Weight of air at sea level
 - (c) Why air far above the earth weighs less
3. Buoyancy
 - (a) Equality of pressure
 - (b) Why balloons rise
 - (c) Why airships do not sink
4. Composition
 - (a) Nitrogen
 - (b) Oxygen
 - (c) Water vapor
 - (d) Other gases
5. What air does
 - (a) Supplies oxygen
 - (b) Absorbs sun's heat
 - (c) Reduces radiation of heat from the earth
 - (d) Permits passage of sound
 - (e) Operates mechanical contrivances

each car. The brakeman had to run from one end of the train to the other, tightening each brake as he went. If the train was long, several minutes elapsed before it finally could be brought to a stop. Many accidents occurred because of defective brakes, and also because a train could not be stopped quickly.

One of these railroad accidents, which he witnessed, set a certain twenty-year-old youth to thinking. Two years later, in 1868, this youth, George Westinghouse, had perfected a device with which the engineer in his cab, by turning a valve, could stop his train. Westinghouse took his plans to Cornelius Vanderbilt, then the foremost railroad man in the United States; but the old "Commodore" somewhat angrily told him that he had no time to waste on fools who thought they could "stop trains with wind." Fortunately, however, Andrew Carnegie and several of his friends were willing to bear the expense of an actual test, and in October, 1868, the first train equipped with the Westinghouse air brake ran from Pittsburgh to Steubenville, Ohio, a distance of forty-three miles. The experiment was entirely successful, and proved that a train could be stopped within its own length. The old-fashioned hand brakes have been superseded, and on all the great railway systems of the world the Westinghouse automatic air brake is used. It has also been adapted for use on electric railways, the power being furnished by an electric motor instead of by a steam engine.

Its Operation. The air brake in use to-day is a great improvement over the first one used in 1868, but the principle is the same. Some of the steam in the engine works an air pump, which compresses air in a reservoir under a pressure of eighty to ninety pounds per square inch. From this central reservoir in the loco-



DETAILS OF AIR-BRAKE MECHANISM

motive, pipes run under the cars the entire length of the train, the connection between the cars being made by rubber tubing. Attached to the bottom of each car is a secondary, or auxiliary, reservoir; this receives the compressed air through the *universal valve*, or *triple valve*, which is the automatic feature of the entire system. So long as the air pressure continues in the train pipe, the triple valve remains in position so that the air pressure is exerted in the auxiliary reservoir but not on the brake; if the pressure is reduced or entirely removed, the triple valve automatically slides, so that the auxiliary reservoir is placed in connection with the brake. If, for any reason, the pressure in the train pipe ceases, the train comes to a stop.

When the engineer wishes to apply the brakes, he throws the handle of the air-brake valve to a specified position, thus permitting the air in the train pipe to escape into the open air. The escape of the air lowers the pressure in the train pipe, and the triple valve, responding to the higher pressure in the auxiliary reservoir, slides back, thus opening an aperture

through which the air in the auxiliary or car reservoir reaches the brake cylinder. The pressure of the air forces the piston of the brake cylinder forward, and the piston in turn, through proper levers, presses the brake shoes against the wheels. When the engineer wishes to release the brakes, he turns the valve in the locomotive so that air rushes from the central reservoir through the train pipe. The pressure then increases on the triple valve, which is forced back, thus opening an aperture through which the compressed air in the brake cylinder escapes into the open air. Inside the cylinder is a coiled spring, which then reacts and forces the brake piston back to its normal position. The brakes are thus released. The valve in the locomotive may be turned so that the brakes operate either slowly or suddenly. See WESTINGHOUSE, GEORGE; LOCOMOTIVE; VANDERBILT, CORNELIUS.

AIR CELLS, a term in botany less preferred than *air spaces* (which see).

AIR COMPRESSOR. See COMPRESSED AIR.



AIRCRAFT. THIS FLYING AGE. The twentieth century has witnessed man's conquest of the air. The airplane which flies so smoothly and swiftly above us is no longer an object of wonderment; we regard it as commonplace. It has made travel so rapid that we have had to revise our conceptions of time and distance. It has caused the United

States to shrink to about the size of Texas, when we compare past and present rates of speed; and the business man in New York can now commute to his farm in Virginia.

There is nothing mysterious in the airplane's performance. The science of engineering has applied well-known laws to the problem of flight, and the modern airplane flies as steadily

Last week there came a strange sound from the sky and, looking up, I saw a thing of fire, a great birdlike, flaming airplane astride the stars. Higher and higher it rose, piercing the sky, and suddenly pivoting on a speck of light, it twirled and shot downward toward the roofs of the city, tumbling like a joyous pigeon from some mystic land, then heading again for the stars across the face of the blinking moon.

With the little shower of appreciation came the thought that the heart of the whole matter lay in the spirit of the tiny man at the control, that the sheer beauty of it came directly from the engineer who created it. Even the great Michelangelo would not have disdained that flowing line and gracious mass and throbbing power.

From *To-day's Beauty*: ANGELO PATRI.

through the air as the automobile rolls on its firm roadbed. The transportation of both goods and passengers is rapidly increasing, and the days of congestion in air traffic are not far away. A recent newspaper headline revealed a crowded condition at the airport of a great city, and the article recommended measures for relieving the congestion. There are still many problems to be solved in regard to the design, construction, and navigation of airplanes, but the public is rapidly accepting them as a means of transportation and is becoming air-minded.

Early Efforts. The spectacular achievements of the present day represent the culmination of experiments and inventions by men of different nations over long periods of time. The earliest stories of man's flight are mythological, like the legendary flight of Daedalus (which see) in the writings of Ovid; and the invention (by a Greek mathematician, Archytos, in 400 B.C.) of a wooden bird which was said to have sustained itself in flight by means of "hidden air." These and other similar tales show that from the days of the remote past men have imagined the possibility of flying, and have longed to imitate the birds in their swift and graceful motion.

The story of man's mastery of nature's forces and his use of them for his convenience contains many interesting chapters, but none more fascinating than the story of the navigation of the air. Viewed in retrospect, the steps in the perfecting of aircraft seem simple, yet they foreshadow a revolution in our ideas of transportation. From the standpoint of the mechanical principles involved, there may be said to be three stages in the development of flight: first, the invention of the balloon, which solved the problem of sustaining weight in the air; second, the application of power to the balloon, to give it direction and controllability; third, the use of power in a machine heavier than air, to raise it and propel it as well.

The Balloon. The invention of the balloon is accredited to the two Montgolfier brothers, Frenchmen, who first experimented with paper bags filled with hydrogen gas. Since the gas readily escaped, they tried to find some other gas which would answer the same purpose. They finally decided that the gas which resulted from burning wood and moistened straw was the best available. In 1783, at Annonay, they succeeded in raising a balloon 35 feet in diameter to a height of 6,000 feet. This balloon was made of pack cloth covered with paper, but it was soon found that silk was a superior material. See illustration, in article BALLOON.

The above feat was considered so valuable a contribution to science that money was raised by popular subscription to continue the experiments. Later in the same year, a larger balloon was sent up at Paris with a chicken, a sheep, and a duck as passengers. These all reached the ground in safety, and Benjamin Franklin, who was an interested observer of the event, wrote to a friend in Philadelphia that in time these "globes" would be used for sightseeing and other useful purposes. Before the year ended, an ascent had been made by Pilatre de Rozier and the Marquis d'Arlandes, who remained in the air twenty-five minutes and sailed over the greater part of Paris. This established the balloon as a means of carrying human beings as passengers, and many other ascents were made in the next few years.

Voyages or trips were attempted, although there was no way to control the direction of the balloon's course. It could be raised by throwing out bags of sand used as ballast; or lowered, by opening a valve that released some of the gas; but its lateral course was wholly at the mercy of the prevailing winds. In spite of this fact, many long-distance balloon voyages were made. In 1836 a trip was made from London to Weilberg, Germany, by three intrepid navigators, Green, Mason, and Holland. They covered a distance of 500 miles in eighteen hours. In 1859 John Wise, an American, made a trip of 800 miles from Saint Louis, Mo., to Henderson, N. Y., in approximately twenty hours. Many other air voyages were made by the aeronauts of different nations, and they proved of some value in contributing to the world's knowledge of air navigation. But the balloon has not become a practical means of transportation, because its direction and speed are not within the control of the pilot. Its principal work has been for observational purposes where height was the chief thing desired.

An international balloon race has been held every year since 1906. The record for distance traveled in continuous flight in a race is now held by Hans Berliner of Germany,



Photo: U & U

Ninety Years Ago. In a flight of imagination, a famous London artist, George Cruikshank, peered into the future. His cartoon was intended to provoke smiles, but it was truly prophetic.

who made 1,800 miles in February, 1914. The record for balloon altitude was made by Captain H. C. Gray, United States Air Service, on May 4, 1927, at Scott Field, Ill. He then attained a height of 42,470 feet. Ascents to high altitudes have been of great value in discovering the conditions in the upper atmosphere. But the rarity of the air and the severe cold have made such feats extremely hazardous. Lately it has become the practice to supply oxygen in tanks to all balloons or airplanes ascending to great heights. Even with this provision, ascents are dangerous. Captain Gray, mentioned above, lost his life

in an ascent from Scott Field on November, 4 1927, because of a broken connection with the oxygen tank. The balloon and his body were found near Sparta, Tenn., the next day, and the recording instruments showed that he had attained a height of 44,000 feet.

It has become the practice to send up small balloons equipped with scientific instruments but without pilots, for the purpose of obtaining wanted information. Such observations are a regular part of the work of the United States Weather Bureau. The facts thus obtained are a valuable addition to our knowledge of air temperatures, pressure, and moisture content.

Aircraft Lighter than Air: The Gas-Bag Type

After the balloon became an accomplished fact, it was natural that there should have been attempts to steer it and propel it by mechanical means. The first efforts at propulsion were made by means of oars worked by hand, just as in rowing a boat. But the power was found to be insufficient. It was not until 1852 that an engine was used to furnish the necessary power. This was a three horse-power steam engine, used by Henri Giffard to drive a cigar-shaped gas bag 143 feet in length. A screw propeller also was used on this model. Although successful flights were made, it was found that the weight of the engine was too great in proportion to its power, and nothing noteworthy was accomplished until the internal-combustion engine began to be developed near the close of the nineteenth century. This type of engine furnishes high power combined with light weight, and makes possible the practical aircraft of to-day.

Another vital question in planning an airship is that of keeping the gas bag inflated. The early types enclosed the gas in a single large envelope, which was subject to sagging, and even collapse, if too large an amount of the gas escaped. Three methods of obviating this disadvantage have been adopted. In the non-rigid type, provision is made for removing sag from the gas bag by small balloons supplied with air by a pump; in the rigid type, contour is maintained by a fixed frame within which the gas is contained in separate compartments; a third type, called the semi-rigid, has a collapsible envelope supported by a rigid keel extending along its entire length.

The second method was brought to a high state of perfection, and is well exemplified in the ships of Count Zeppelin, of Germany, which are to-day regarded as models for successful aircraft of this type. He brought out his first airship in 1900. It was 416 feet long and 38 feet in diameter, and contained seventeen compartments in the gas bag, which had a capacity of 399,000 cubic feet. By 1910 he had established a commercial air route from Friedrich-

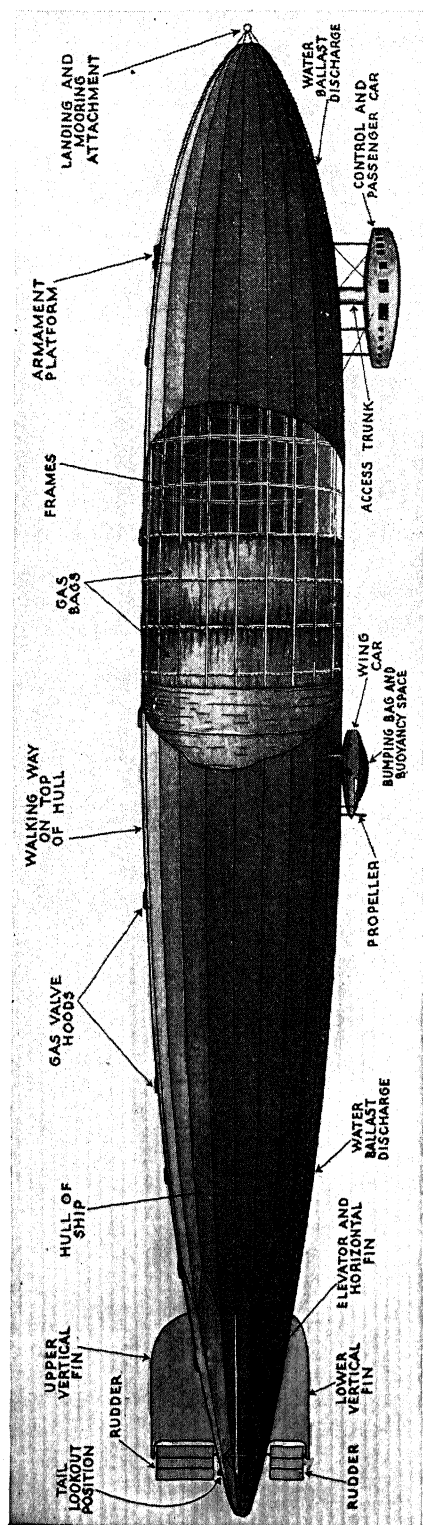
shafen to Düsseldorf, a distance of 300 miles.

The huge size of the Zeppelins gives them great lifting capacity, but it has the disadvantage of exposing a large surface to the wind. Several of these ships have been wrecked by storms, both while in the air and while moored to their stations; this hazard constitutes their chief source of danger. But their powerful engines and great capacity give them a wide field of usefulness, which was further proved in the voyage of the *Graf Zeppelin* to America before the end of 1928.

Credit for the first successful application of the gasoline engine to the driving of an airship is given to Santos-Dumont, a Brazilian, who carried on his experiments while residing in Paris. In 1898, he constructed an airship 82 feet long, equipped with a 3½-horse-power gasoline motor. He flew this ship successfully, and followed it immediately with others of enlarged and improved design. In 1901 he won a prize of 100,000 francs which had been offered for a trip from Saint Cloud, a Paris suburb, around the Eiffel Tower and back within thirty minutes.

Other designers in France were the Lebaudy brothers, who produced a large number of airships which were used chiefly for military purposes. They used the semi-rigid type, in the main, though they experimented with the others, but in 1909 after an accident caused by a broken propeller blade which cut through the gas bag, they adopted the Zeppelin plan as standard.

In general, it may be said that the preferred type of construction depends upon the purpose for which the airship is designed. The non-rigid type has been most successful in small sizes which are easy to carry along and inflate as needed. They are used for inspection trips where the ability to fly a long time at slow speeds is desired. They do not require large landing fields nor permanent stations for their housing. But the large Zeppelin type seems to be the highest realization of the possibilities of the airship. The results obtained from the Zeppelin by Germany have been studied with keen interest by other



PARTS OF A ZEPPELIN TYPE OF AIRCRAFT

countries, particularly Great Britain and the United States. It was this type of airship which enabled Major Scott in July, 1919, to fly the British dirigible *R-34* from England to the United States in four days and return safely in three; and, in October, 1924, the Zeppelin *ZR-3*, afterward named the *Los Angeles*, flew from Germany to the United States. The first passenger Zeppelin to reach the United States flew in October, 1928. (See page 137.)

The "*ZR-1*," Renamed "*Shenandoah*." Under the direction of experts, brought from Germany for the purpose, the United States government constructed its first giant of the air, which was christened the *ZR-1*. Contrary to popular belief, the "*Z*" does not mean "*Zeppelin*"; it is the navy designation for "*dirigible*." "*R*" means "*rigid*," to distinguish the type from the balloon, or sausage-like, vessel. The "*1*" is the numerical designation of the particular airship to which it is attached.

Description of This Ship. The *ZR-1* in the air was described as a "great silver whale." It was 680 feet in length—about one-eighth of a mile; it weighed 76,000 pounds, and had a gross lifting power of 110,000 pounds, which provided for its crew and sufficient fuel for a cruise of 5,000 miles at an average speed of 65 miles per hour. The outer covering was silk and a fabric known as gold-beater's skin; a coat of silvery aluminum paint was spread over the surface to make it impervious to the weather.

It was the first airship to be inflated with helium gas, without which this type of vessel could never be made safe, for helium is non-inflammable. Hydrogen gas, formerly employed, has a somewhat greater lifting power, estimated eight per cent greater, but its use has been disastrous, the English *ZR-2* and the Italian *Roma* having been destroyed, with loss of life, through ignition of their gas tanks.

The *Shenandoah* had a speed of 75 miles an hour, and it could also float in the air for days, if necessary, keeping in slight motion, for steering purposes, by the use of a single motor, scarcely depleting its huge stores of helium and gasoline.

Loss of the Shenandoah. On September 2, 1926, this American-built ship—"an eighth of a mile of shimmering white"—constructed for the United States navy, left its hangar at Lakehurst, N. J., to make a tour of the Middle West. It was in charge of Lieutenant-Commander Zachary Lansdowne, who had under him forty-two men. In Eastern Ohio early in the next morning, it encountered a violent storm, into which, in apparently the worst phase, the great airship plunged. It is known that powerful upward currents forced the craft to a height of about 7,000 feet, when opposing upward and downward currents tore off the control car underneath the forward end and

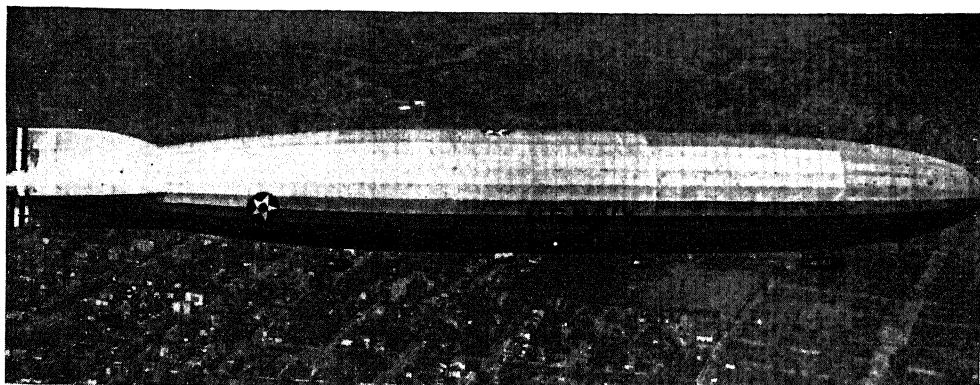


Photo: P & A

THE SHENANDOAH: NEARLY AN EIGHTH OF A MILE OF SHIMMERING WHITE

split the ship into three pieces. In the control car were Lansdowne and thirteen men; all of them dropped to the earth, the car falling like a plummet, and were instantly killed; the larger section fell, rear end downward, and the impact softened the crash, saving the lives of those aboard. The forward third of the ship floated a dozen miles and came to earth without the loss of any of the men in that section. In addition to the fourteen dead, two of the remaining twenty-nine suffered injuries.

America's "Los Angeles." At the close of the World War, the allied countries allotted to the United States two of Germany's Zeppelin airships, from the fleet which had spread consternation throughout France and England by its aerial attacks upon cities. They were never delivered, for their German captains destroyed them rather than permit their ownership to pass to former enemies. Germany was ordered to produce one new and larger Zeppelin for the United States, and deliver it in perfect condition for flight.

This new and greater Zeppelin, the ZR-3 (Zeppelin Rigid No. 3), became the property of the United States navy, and was rechristened the *Los Angeles*. Delivery was effected by its German builders on October 15, 1924. The ship was navigated from the factory at Friedrichshafen, Germany, to its hangar at Lakehurst, N. J., in a nonstop flight of 5,066 miles in 80 hours 45 minutes.

This later queen of the air is shorter than the *Shenandoah* by twenty-four feet, its length being 656 feet, but its diameter is greater by twelve feet, which gives it capacity for 300,000 cubic feet more of buoyant gas than was possessed by the *Shenandoah*. The vessel can navigate with a load equal to its own weight, which is forty-six tons. The cabin, larger than a Pullman car, is built below and into the bottom of the hull, and has accommodations for twenty passengers. It is divided into five open compartments, each designed for four persons. Day sofas are con-

verted into beds at night. In addition to the passenger-carrying capacity of the ship, there is space for several tons of mail. A maximum speed of seventy-six miles an hour (a mile and a quarter every minute) for 3,500 miles can be maintained; seventy miles an hour is the average cruising speed for a nonstop journey of 5,000 miles. Not until the *Graf Zeppelin* was completed in Germany in 1928 had any dirigible that has borne the name of Zeppelin ever reached this degree of efficiency.

Difficulties Overcome. Because of the difficulty of putting an airship in an enclosure when the wind is blowing, a method of fastening it to a post, or mooring mast, has been devised. This enables it to swing in any direction and to be moored even in unfavorable weather.

It has been successfully demonstrated that an airplane can be carried by an airship, and that the plane can fly from it and return to it while both are in motion. No doubt the chief use of this plan will be in connection with military or naval operations.

Study and experiment will further perfect the airship. The value both in peace and war will many times repay the cost of research and experimentation. In 1930 Great Britain completed the building of two airships with a gas capacity of 5,000,000 cubic feet each; the United States has authorized the construction of two of 6,000,000 cubic feet each; while Germany built one, the *Graf Zeppelin*, in the year 1928.

Problems to Be Solved. We see that one of the serious defects of the large airship is its inability to cope with adverse weather conditions. Its structural weakness in proportion to its enormous size makes it peculiarly susceptible to unfavorable conditions of wind, ice, and fog. Also, the action of a large volume of gas under various stresses must be studied still further. The stability of the airship depends upon maintaining the pressure of its gas on an equality with the pressure of the surrounding atmosphere at all

times. Since the pressure of the air varies in accordance with the height of the ascent, it is obvious that some provision must be made for the gas to expand without disastrous effect. This is usually done by allowing it to escape through safety valves, but if changes in altitude or temperature are too rapid to permit of adjustment by this means, the gas may expand too rapidly, with resulting explosion.

Aircraft Heavier than Air: The Airplane

The success of modern airplanes of the heavier-than-air type, which includes biplanes and monoplanes, is an achievement to be proud of. Although utilizing well-recognized principles, and based upon facts which were generally known to scientists, the achievement of rapid, safe travel in machines heavier than air is a feat which challenges admiration. How did the airplane develop from previous forms of aircraft? The process was gradual, and was aided and contributed to by many inventors and men of science. Among the important scientific studies which contributed directly to the invention of the airplane may be mentioned the work of Sir Hiram Maxim of England and that of Professor S. P. Langley of the United States.

The work of Maxim was chiefly with reference to the resistance of the air to plane surfaces, and the measurement of the force of screw propellers. His experiments were begun in 1889, and resulted in the building in 1893 of a multiplane driven by a steam engine with twin-screw propellers; this was the largest ever built up to that time. The ratio of the total weight to the power was eleven pounds to the horse power. He proved that it was possible to make a machine which would not only sustain its own weight in the air, but carry an additional load as well, and that such a machine did not need a balloon of any kind to support it. His machine was not a practical success, but its construction was a milestone in the development of the airplane, as many of his principles are used in present-day practice.

The experiments of Professor Langley were begun in 1887, and by 1896 he had built a machine which he called an "aerodrome," which flew as far as three-quarters of a mile, though without anyone in it. This model was driven by a steam engine, and was the first example of a plane capable of flying under its own power. He then constructed a larger model designed to carry a man. Its engine developed 52 horse power, and weighed only 2.2 pounds per horse power. Even today this is considered a remarkable achievement. [The experimental flights of this plane in 1903 failed, on account of accidents which damaged the landing apparatus in attempted

The two chief advantages of the airship justify its continued improvement. These are the possibility of increasing the speed and range equally with increase in size, and the ability to sustain itself in the air without power being applied. Although recent progress has not been as great as that in heavier-than-air craft, we may well expect the airship ultimately to realize the full possibilities which present-day knowledge justifies.

take-offs, but if his funds had not become exhausted, it is believed that Langley would have carried his work to successful completion. His studies were so valuable that they have been used freely by his successors, and are recognized as fundamental contributions to the development of aviation.

Man Learns to Fly. Two brothers, Wilbur and Orville Wright, lived in Dayton, Ohio. As boys they had been of an inventive turn of

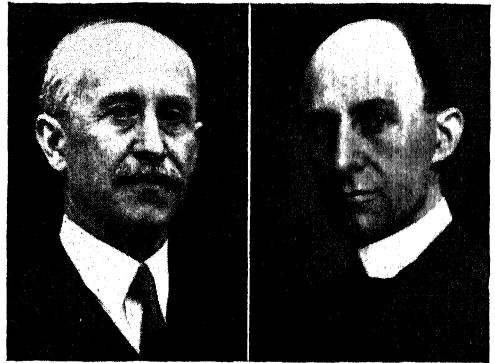


Photo: U & U

Orville Wilbur
THE PERSEVERING WRIGHT BROTHERS

mind, and had enjoyed "making things that would run." One of their first enterprises, after leaving high school, was the publication of a small weekly newspaper, printed on a press which had been constructed entirely by themselves. In 1894 they were engaged in the job-printing business, and besides, they owned a bicycle shop, where these machines, which were then very popular, were manufactured. They first thought seriously about flying in 1896, when an account of Otto Lilienthal's death in an experiment with a glider came to their notice. Their discussion of this catastrophe led them to read all the books on flying which they could find. They were impressed with the great amount of material which had been written on the subject, and began to realize that flying was a very serious problem.

They found that there were two sets of theories about it. One group believed that the solution of the problem of flight lay in the use of power for propelling the airplane.

This school was represented by Sir Hiram Maxim of England, Clement Ader of France, and Professor Samuel P. Langley of the United States. The other group was working with gliders, in an attempt to fly without the use of mechanical power. Prominent advo-

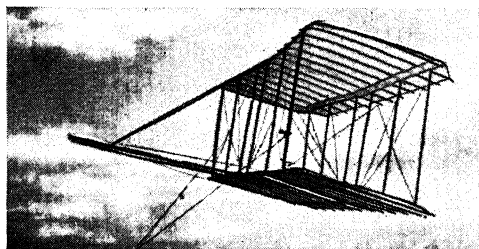


Photo: Brown Bros.

THE FIRST WRIGHT GLIDER

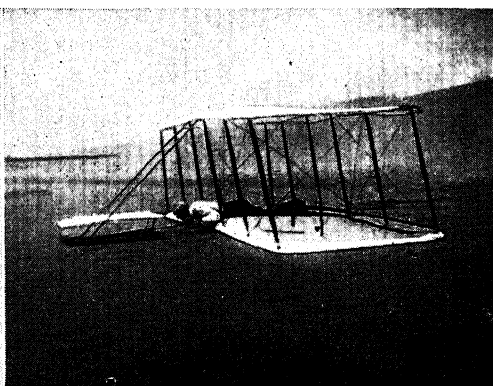
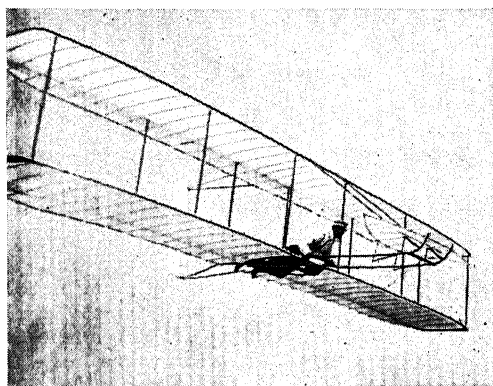
It was flown at Kitty Hawk, N. C., in October, 1900. The balancing machinery was controlled from the ground by cords.

cates of this idea were L. P. Mouillard of France, Otto Lilienthal of Germany, Octave

for warping or twisting the ends of the flexible wings, giving the same effect as was later obtained by the ailerons. They used spruce wood for the wing spars and strong muslin for the outer covering. They also curved the wings, but to a lesser degree than that specified in the tables of Lilienthal, who had shown that curving the wings gave them a much greater lifting power than flat wings possessed.

After completing their design, they wrote to the Weather Bureau in Washington for information as to a location where they might find a steady wind of at least eighteen miles per hour. They were told that there were many such places along the Atlantic coast. They selected Kitty Hawk, N. C., as a place suited to their requirements, for it not only had the wind which they needed but also high sand dunes which would furnish ideal runways for taking off.

Late in the summer of 1900, they assembled their machine at Kitty Hawk and flew it first



Photos: Brown Bros.

EARLY EXPERIMENTS OF THE WRIGHT BROTHERS

Two gliders, built in 1901 and 1902. Nearly 1,000 very short flights were made in the machine at the left. The one at the right was unsuccessful as a manned kite, but as a glider it sailed more than 300 feet, and maintained its equilibrium in a 27-mile breeze.

Chanute of Chicago, and Percy Pilcher of England.

The Wrights decided to follow the theory of gliding flight, partly because they were taking up the subject as recreation rather than as a business, and hence did not wish to spend a large amount of money on it, and partly because they believed that the problem of equilibrium, or balance, in the air was the most important question and should be solved first.

They built their first glider in 1900. It had two wing spans trussed with wire, with a total area of 165 square feet. Each wing was 18 feet long and 5 feet wide. It had a small plane placed in front which could be tilted by the operator and thus enable him to make the glider go up or down. It also had a device

as a kite, as they could thus observe its performance without danger. Afterward they made a few gliding flights, and although the plane would soar in the air, it was hard to control. Its chief defect was that it would not fly level in the wind, even when the pilot shifted his position constantly to balance it. But they were pleased to find that the elevator worked, and that the warping of the wings helped to stabilize the machine. Although they had actually been in the air but a few minutes, the results were so encouraging that they decided to build another glider and test it at Kitty Hawk the next summer.

Their second glider was larger than the first, the wings being 22 feet long and 7 feet wide. The curve of the wing was increased to conform to Lilienthal's tables. They made

a flight of 300 feet late in July, but the plane was so hard to control that the utmost skill was required to keep it from diving to the ground. In order to find out the trouble, they removed the upper wing and flew it as a kite. From this experiment they concluded that the

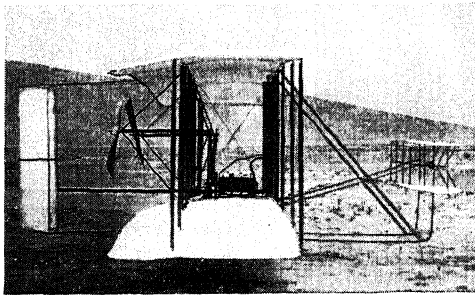


Photo: Brown Bros.

WRIGHT'S FIRST POWER MACHINE

This airship was completed in December, 1903.

wing curve was at fault, and they changed it to conform to their first glider.

At the end of the summer of 1901, they were almost ready to give up their attempts, as they felt that the results did not justify the time and money they were spending. However, once back in Dayton, they found themselves unable to drop the subject. They began to go more deeply into the study of wind pressure and to examine all the figures which had been published on the subject.

It was during that winter that they built a wind tunnel, the first one ever constructed. It was a square tube 16 inches across and 6 feet long. It had a fan at one end to produce the air current. By this means they tested small wings, from three to nine inches in length, cut out of sheet metal. This patient research work gave them many useful facts about the shape and curvature of wings, and they began with renewed confidence to plan a third glider.

This machine had wings 30 feet long and 5 feet across. They flew it first as a kite, as they had done with previous models, and then began going up in it. They found it more stable than the others, and capable of flight under almost any condition of wind or weather. Their flights were short, usually not more than five or six hundred feet, but they were learning the reasons for failure and acquiring scientific data of the utmost value in their future work. They were soon planning a machine which would be equipped with an engine and propeller instead of having to depend on the wind as motive power.

The airplane which is credited with the first flight carrying a man in an engine-driven craft was constructed by the Wrights, engine and all. They planned to provide

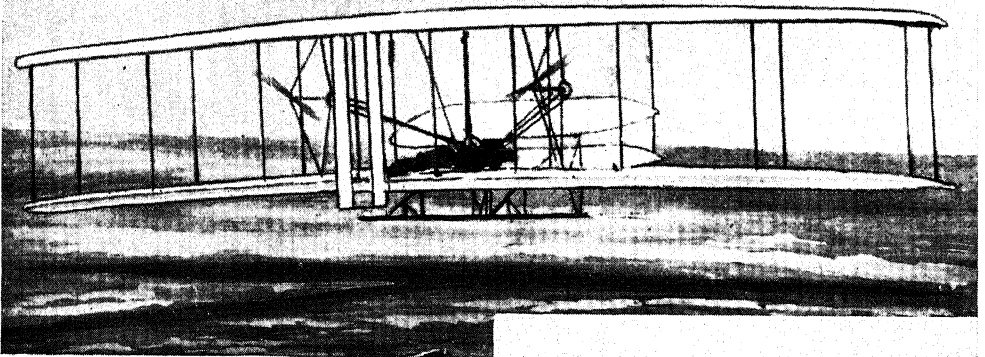
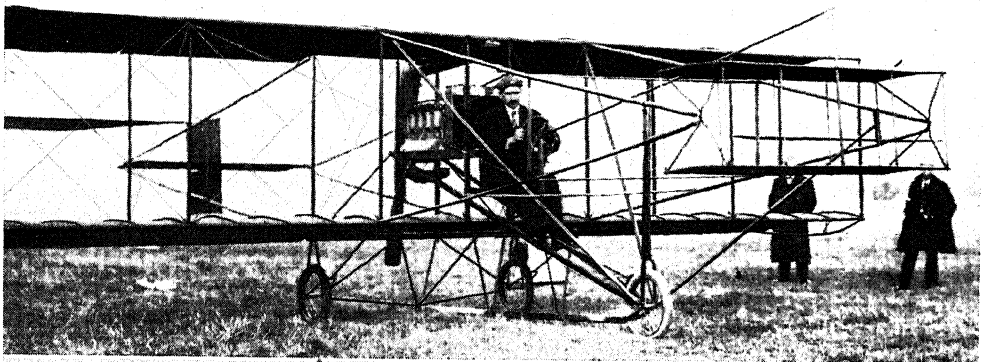
for the carrying of 600 pounds total weight, with an engine of eight horse power. They also designed the propellers, basing their design on the theory of marine propellers. Two propellers were used, in order to secure the benefit of as large a quantity of air as possible. These were driven by chains. Skids similar to sled runners were used to aid in taking off. The plane itself was similar to the glider which had flown so successfully in 1902, except that it was slightly larger.

It was late in the season of 1903 when the machine was finally assembled and ready for flight. The weather was unfavorable, the wind being unusually strong. When they were ready to attempt a flight, they tossed a coin to decide who should first act as pilot. Wilbur won, but when they tried to launch the plane into the air, something went wrong, and it settled to the ground. Minor repairs were necessary, and it was three days before another flight could be attempted. This time it was Orville's turn, and he had better fortune. On December 17, 1903, he made a short flight, lasting only twelve seconds and covering a distance of about 120 feet. But it was enough to convince the brothers that they were on the right track. They made three more flights that day, although the wind continued to blow a gale. Toward evening a strong gust struck the plane and turned it over on the ground, causing damage which prevented any more flights that year.

The problem of human flight was solved. They returned to Dayton, established a flying field a few miles from town, and began a new series of experiments which made flying a common sight in the neighborhood. The brothers then gave up their other business interests and devoted themselves entirely to the development of the science of aviation.

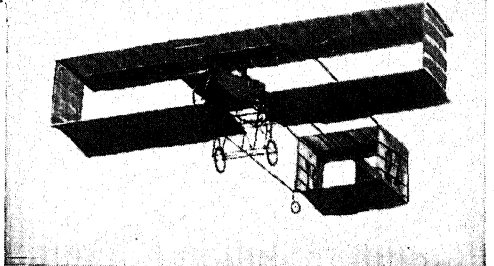
People generally paid little attention to this epoch-making flight at the time. Few knew of the event, or believed that it had actually been accomplished. Only in recent years has the world awakened to the significance of their achievement and begun to accord to Wilbur and Orville Wright their well-earned place in the list of humanity's benefactors.

A subsequent machine built by them in 1908 was so successful that it was accepted by the United States army and used for the instruction of officers in the art of flying. From that date forward the army and navy departments of the United States and several European nations became important agencies for the improvement of the airplane. Problems of design and construction were gradually transferred from the field of invention to that of engineering; that is, originality of conception was not so much sought after as the principles underlying the constructing of flying machines



THREE EARLY SUCCESSES

Above: Glenn H. Curtiss, pioneer designer, at the controls of one of his earliest models. The picture gives a fair idea of the lightness of construction of early airplanes; bamboo was largely used. Center: A front view of the Wright machine shown in the preceding illustration. This is the machine which Orville Wright sent to an English museum in 1927 because the Smithsonian Institution in Washington did not give it precedence over the Langley exhibit as the first successful airship. Below: Henri Farman, a Frenchman, flew this airship in 1908. There was great enthusiasm over a successful flight of five-eighths of a mile.



Photos: U & U

with stability, speed, and control; and by the beginning of the World War in 1914, airplane flights were definitely established as practicable. (See *The War in the Air*, below.)

Why the Airplane Flies. Air in motion produces pressure upon stationary objects with which it comes in contact. This is shown in the effects of wind storms, which have many times illustrated the terrific power of the wind when moving at a high velocity. From the standpoint of mechanical principles, the pressure or force is the same, whether the air moves against an object or the object is moved through the still air. If a flat surface is held in the path of an air stream, the force of the

air against the surface will be in the direction of *F* in Figure 1. If the surface is turned at an angle of 45 degrees to the direction of the air stream, the force will be exerted in the direction of *F* in Figure 2; that is, at right angles to the surface which is acted upon. It will be seen from the direction of *F* in Figure 2 that this force, caused by the deflection of the air stream, provides in a general way a lifting force for this surface. Also, it has been found by experiment that the air which passes over the upper part of the surface cannot change its direction soon enough to follow the back of the surface completely. This creates a partial vacuum, which causes

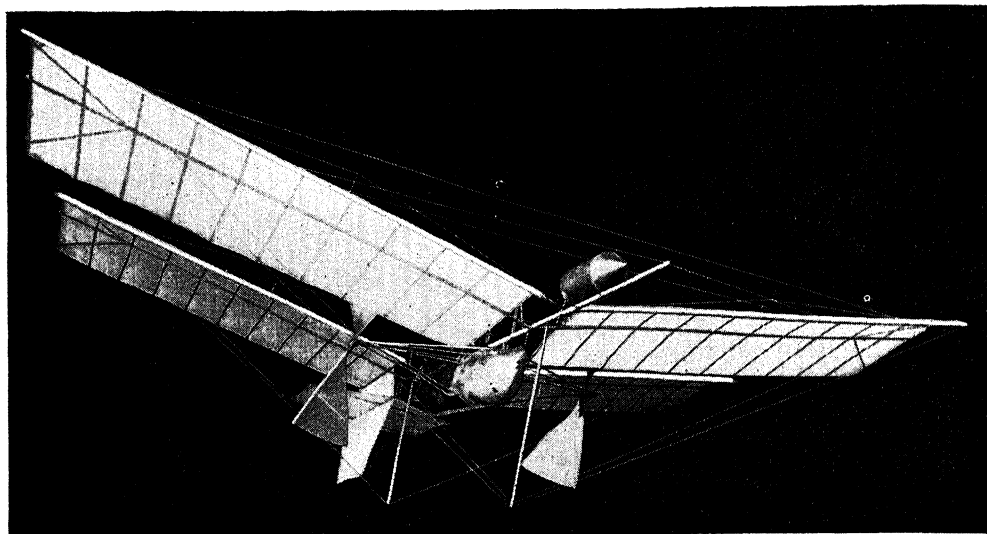
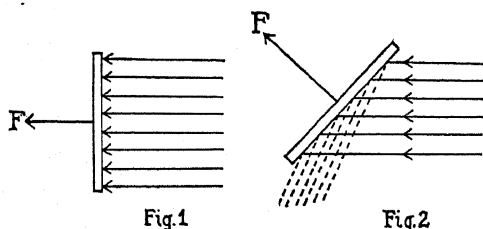


Photo: Harris & Ewing

THE LANGLEY AIRSHIP

A steam-driven machine of one and one-fourth horse power, which on May 6, 1896, at Quantico, Virginia, made what is claimed to have been the first successful flight by a heavier-than-air machine driven by its own power. This original model is in the Smithsonian Institution, Washington, D.C. Orville Wright withdrew his own original machine from the Institution and sent it to a British museum, because he and his friends claimed that the Langley model is not the original, but a rebuilt one.

a suction to be exerted in the direction of the vertical. This action materially assists in lifting the object, and is in fact more powerful than the direct lifting force. It has been



found by careful experiments that from three-fifths to three-fourths of the total lifting force is due to suction. In applying these principles to airplane design, it was important that the suction should be made as great as possible, since this was the chief lifting force. Experiments proved that by making the front edge of the plate or wing thicker than the back edge and curving it

slightly, the maximum suction could be secured. Strangely enough, when this design was worked out, the cross-section of a plane wing was found to resemble somewhat the cross-section of the wing of a bird. But the plane wing was not designed in imitation of the bird's wing; it was developed experimentally and based upon known laws of the action of air in motion. This curving of the wing surface is technically called *camber*, and is one of the most important elements in correct design.

Another consideration almost equally important is the reduction of the resistance of the moving body by shaping the parts so that they will cause the least possible disturbance of the air in passing through it. This is called *streamlining*, and is accomplished by rounding the forward portion and tapering or pointing the rear portion of the wing or other part.

If a flat surface, Figure 1, exposed to an air stream, causes a resistance of eleven pounds to the square inch, we can, by adding a curved surface in front, reduce this resistance to seven

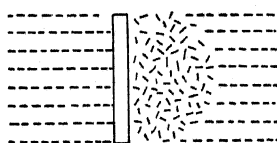


Fig.1

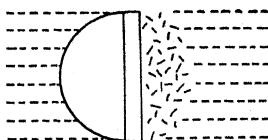


Fig.2

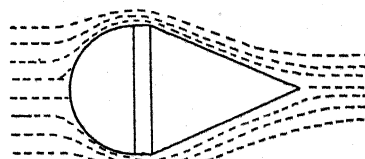
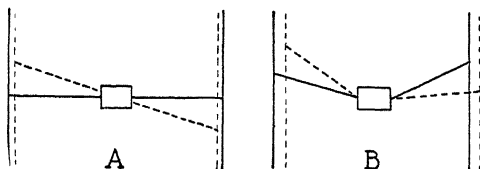


Fig.3

pounds per square inch. By adding a pointed or cone-shaped rear portion, the resistance is reduced to one and one-half pounds. This shows the tremendous effect of streamlining. This principle is so essential that it is applied to the wings, body, wires, struts, and all ex-



posed parts of the plane, so far as possible. Notice the provisions for streamlining on the next plane you see.

The above principles worked out in detail will produce a wing capable of lifting itself into the air and advancing with the least resistance, when supplied with an air current by the propeller.

Although a curved or cambered wing possesses great lifting capacity, it is very unstable, and must be supplemented with several devices in order to enable it to ride steadily in the air. The center of gravity of a cambered wing, when placed at an angle with the air stream, is very different from that of a flat plate or plane. Hence, stability must be achieved by some force outside the wing itself.

This is accomplished by means of a tail plane smaller in area than the wings (usually about one-ninth that of the wings), placed in the rear and at a lesser angle to the air stream. It enables the plane to fly smoothly and steadily on a horizontal path. The rear part of the tail is hinged, so that it may be elevated or depressed, thus altering the angle of the wings and causing the plane to ascend or descend. Pushing the control-stick forward depresses the trailing edge of the tail plane and causes the airplane to dive; pulling it backward has the opposite effect. The elevator is the altitude controlling mechanism of the plane.

Right- and left-hand directions are obtained by means of a rudder. It is placed above the tail plane, and acts just like the rudder of a boat. The rudder will provide for steering, but it is not adequate to secure stability in this direction; this is accomplished by means of a vertical fin placed in advance of the rudder. This enables the plane to right itself and swing into the wind when its course is disturbed by side gusts or lateral air currents. These two devices, the tail plane and the tail fin, make it possible for the plane to maintain a horizontal position in flight and stabilize it in a lateral direction.

There is also a rolling motion to be overcome.

This occurs when a side gust tends to roll the plane about its longitudinal axis. It has been found that this can be corrected by giving the wings a slight upward slope from the center, like a flattened V, which is known as a dihedral angle.

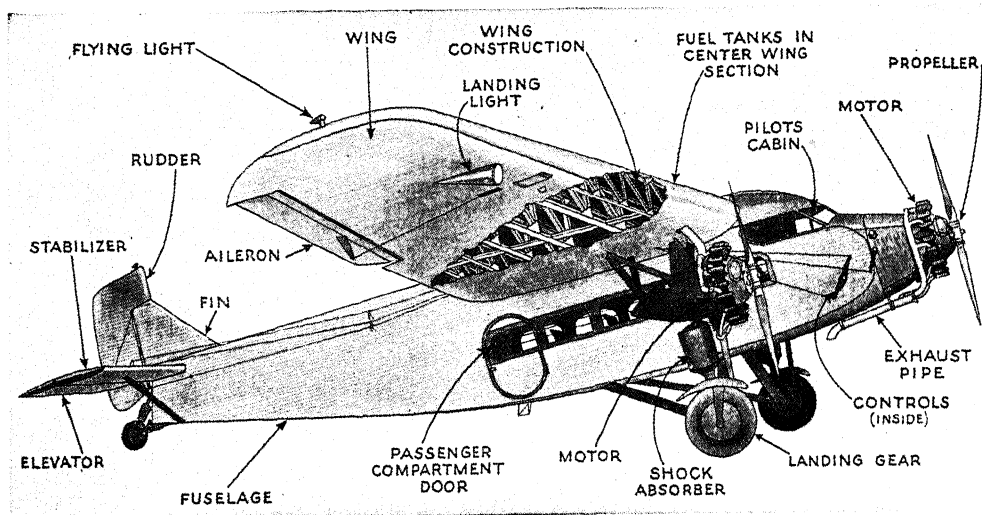
A glance at the diagram will show the principles involved. In A we have a diagram of the front of a plane, with the wings arranged horizontally. If a gust causes one wing to lift and the other to lower, the length which they present to the air stream is unchanged. In B, if the same condition arises, the depressed wing acquires greater lifting power, because it offers a relatively greater surface to the air stream. This will cause the depressed wing to lift, and so right the plane.

The next problem is to secure the ability to turn in the air without side slipping. Owing to the high speed at which a plane is operated and the yielding nature of the medium which supports it, side slipping is inevitable on making turns, unless special provision is made to counteract it. This motion is comparable to the skidding of an automobile, which happens when the centrifugal force of a turn overcomes the friction between wheels and road. In order to produce friction in the air and thus overcome side slipping on turns, the airplane is equipped with a device enabling the pilot to bank, or angle, his plane in such a way as to present the entire undersurface of the wings to the air, and thus increase the friction. Banking is accomplished by small flaps made in the back edge of the wings near the outer ends. These flaps are called *ailerons*, and are so arranged that when one is lowered the other is raised. This increases and decreases respectively the lifting force on the wings, and enables the pilot to turn in a banking position.

There are other problems to be decided before a plane is fit to fly, such as the size and shape of the wing, whether square or rectangular; the shape of the ends of the wings, and the position of the wings with reference to the weight of the plane. These details have been worked out experimentally by constructing small models and trying them out in wind-tunnels—a contrivance for producing artificial air currents under controlled conditions. Largely as a result of such experiments, wings are rectangular rather than square in plan; the ends are raked, that is, the trailing edge of the wing is made longer than the leading edge, and the wings are so mounted on the plane that the center of gravity is slightly ahead of the center of the lifting force of the wings. This will cause the plane to nose down gently when the power is turned off.

These adjustments enable the plane to fly, and give it stability and controllability.

The design has been so perfected that a



PARTS OF A MODEL MONOPLANE

prominent author describes the result as follows:

Poised in a medium so thin that we can breathe it, the modern airplane in flight is as firm and steady as a rock. Cross winds will blow and gusts will burst, but the airplane, steadied by the very gusts and cross winds which originate the disturbance, will fly smoothly on its way, rocking and jerking no more than does an automobile riding over a smooth concrete highway. Such is the degree to which the air has been harnessed by modern aerodynamics. (Le Page's *The A B C of Flight*.)

Does this seem an extravagant claim? Could such results have been obtained by science? If so, why have there been so many accidents, and what of the deadly tail-spin which so often proves disastrous? These questions may be answered in part by reminding the reader that there are problems of navigation, as well as problems of construction. Even if a machine be correctly designed and constructed, and capable of flight under any and all conditions, there still remains the problem of operating it skilfully. The automobile is an efficient machine, but the driver needs skill and experience. The steamship is mechanically efficient, but it must be skilfully navigated. In like manner, the airplane is conditioned by the human factor, and is no more automatically efficient than other machines of its kind.

As for the tail-spin, it was a method developed by aviators during the World War to lose height with great rapidity. The front of the plane points toward the ground, and the plane spins like a top as it descends. The method of bringing the airplane out of a spin is to reverse the controls, and as soon as the spinning stops put them in neutral. This will allow the plane's inherent balance to be

restored. However, this can only be accomplished when there is sufficient height to permit of the return of normal stability before striking the ground. If a tail-spin is started too near the earth, a crash is almost inevitable. Experiments with model ships in wind-tunnels are revealing laws which govern the motion of an airplane when spinning, and this problem will soon be added to the solved problems of aviation.

Airplane Construction. The chief features of modern airplane construction are apparent in the accompanying illustrations. The early planes were made of wood, covered with fabric and braced with wires. The present trend is to use metal exclusively. For this purpose the new metal duralumin has been found especially suitable, since it combines strength with lightness of weight. Duralumin is an alloy consisting of about 95 per cent aluminum, 3 per cent copper, 1 per cent manganese, and .5 per cent magnesium. It resembles steel, but has only one-third its weight. The use of the all-metal type of construction is more expensive than wood and wire, but metal lasts longer and adds to the safety of the plane.

The construction of the central portion of the wings is shown in the second illustration on page 126. The fuel tanks are located in this section in the completed plane. The truss type of construction with vertical and diagonal members gives great strength and rigidity to the frame. The wing tip is shown (third illustration on page 126), with the leading edge at the bottom. The rib spars have holes cut in them to remove part of the material. Lightness of weight in the wing is thus secured without greatly reducing the strength of the rib.

The illustration at top of page 126 shows a main wing spar. This form is known as a Pratt truss. It can be built to exact dimensions, and its sturdy construction prevents warping or collapse under strain.

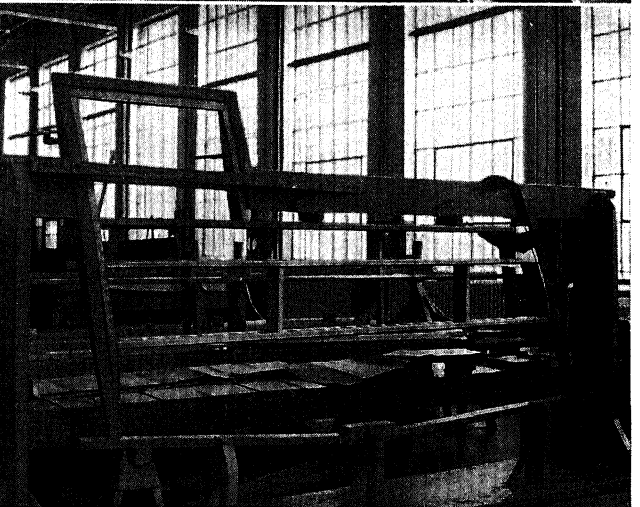
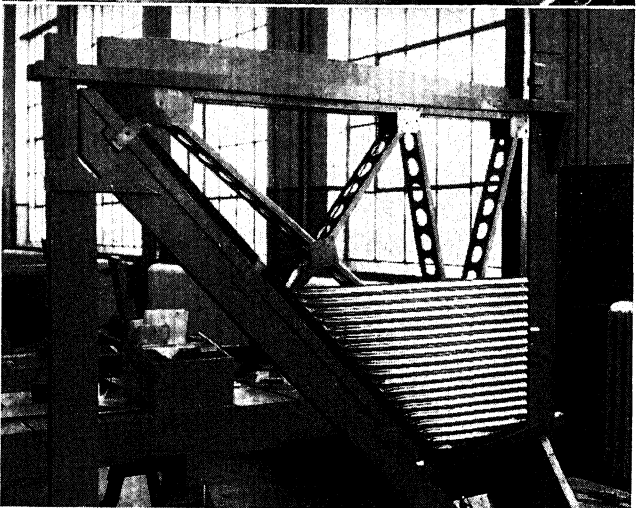
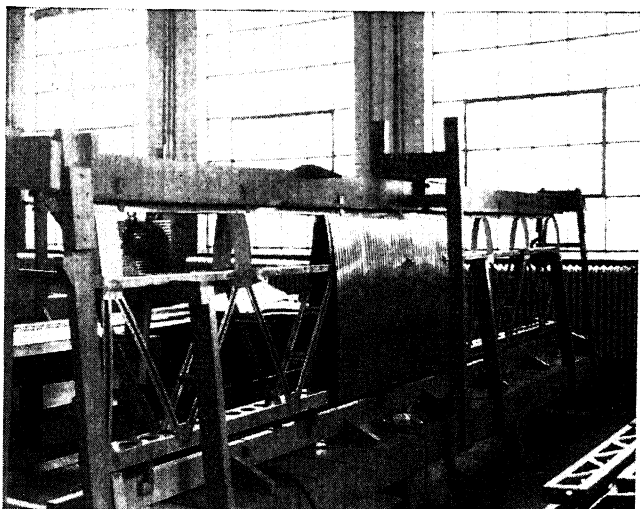
A comparison of this type with the open-cockpit ship of World War time will show the remarkable advances which have been made. Not the least of these improvements are the features which contribute to comfort and safety. Another illustration is a view of the modern cockpit, equipped for two pilots and furnished with the various instruments required in navigation. It greatly resembles the driver's compartment of an automobile.

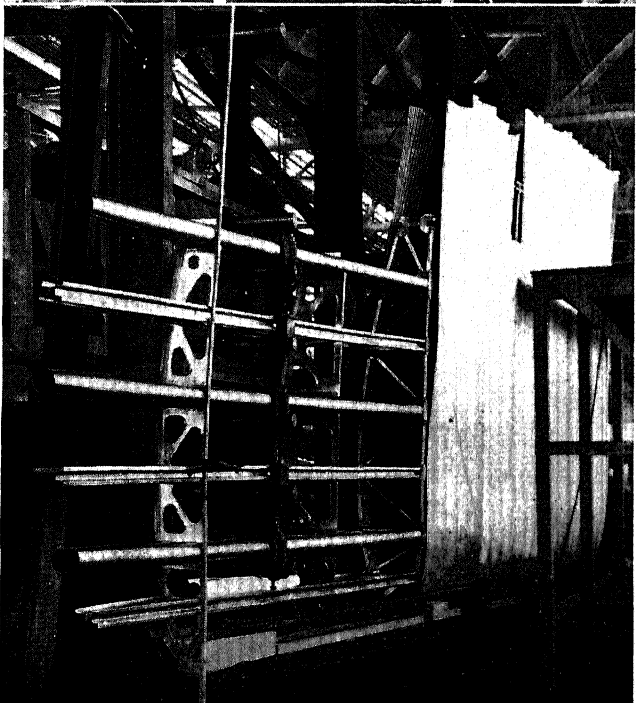
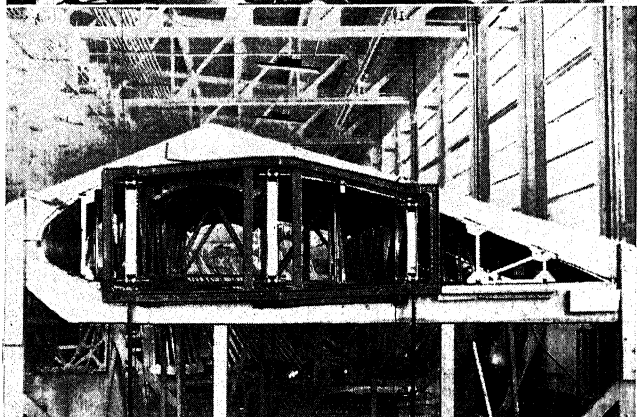
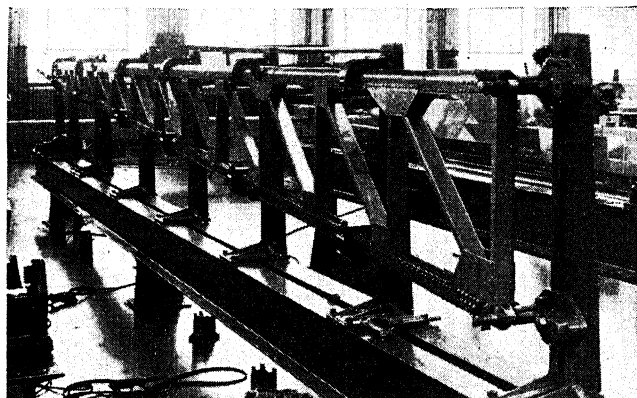
The passengers are provided for in a comfortable cabin. They do not need to wear the helmets, goggles, and leather coats which were inseparably connected with airplane trips only a few years ago. The closed airplane has developed more rapidly than did the closed automobile. Another item in passenger comfort is the reduction of the noise of the plane in flight. Mufflers are being developed which will reduce the noise of the airplane engine—but the hum of the propeller is still a problem.

The development of the motor has kept pace with the improvements in design and construction. The early motors had small horse power and were very heavy in proportion to their power. For example, the engine of the Wright plane of 1903 was sixteen horse power, and it weighed twelve pounds per horse power. To-day we have engines that will develop 1,200 horse power which weigh less than two pounds per horse

STABILIZER, RUDDER, AND FIN

The heavy framework in the three illustrations does not represent parts of the airplane; these are called assembly jigs, and are the frames for holding the parts in position during manufacture. At top is a stabilizer frame, partially covered; in the center, the fin is being assembled; at the bottom is a rudder frame assembly, with all of its structural parts riveted together.





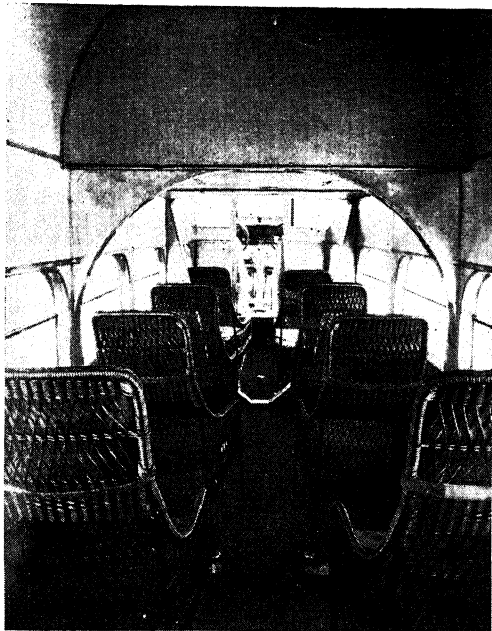
power. Along with this improvement has come increased durability. Engines can now be used for 400 to 450 hours without overhauling. At current rates of speed, this represents a possible range of travel of 40,000 miles. These improvements have made possible a ten-hour express service from New York to Chicago, and a thirty-hour schedule from New York to San Francisco.

Aircraft Carrier, a vessel of war designed for the exclusive purpose of carrying aircraft. During the World War various attempts were made to launch planes from the decks of battle-ships, but they were not entirely successful. Several light cruisers were then rebuilt, with an unobstructed deck to permit landing as well as taking off. The *Furious* of the British navy was one of the first to be converted into a carrier. One of the difficulties encountered was the disturbance around the funnels caused by rising air and fuel gases. It was necessary to divert these currents from the main deck. In later models this was accomplished by carrying the funnels up at the side of the ship, thus leaving the deck clear to be used as a runway. This side structure is called the island, and in addition to the funnels, contains gun turrets, signal masts, fire-control towers, and other features.

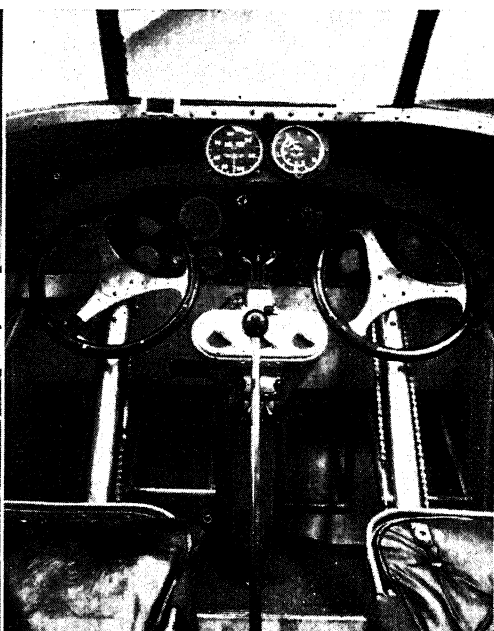
The aircraft carrier first received recognition as an essential member of a fighting fleet at the Washington Conference in 1921. At that conference the carrier was defined, its tonnage and armament were agreed to by the governments represented, and the total tonnage allowed to each nation was fixed. The United States has two carriers, the *Lexington* and the *Saratoga*, both com-

WING (MAIN SPAR), WING CENTER SECTION, AND WING TIP

The pictures at the left show the assembly of three parts of the airplane, described in adjoining text. The observer will not fail to note that in modern aircraft, bamboo, wood, and cloth have been superseded by steel.



PASSENGER CABIN OF MODERN AIRPLANE



Photos: National Air Transport

DUAL CONTROL IN THE COCKPIT

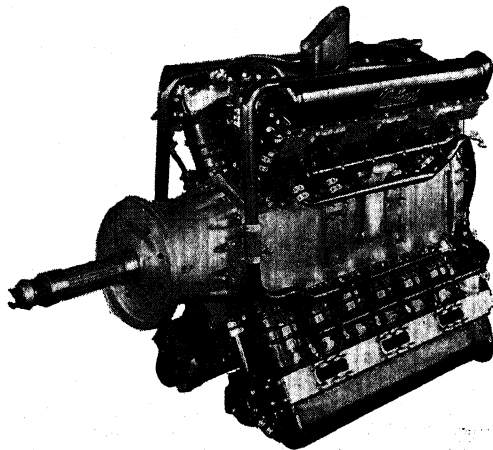
pleted late in 1927. They are sister ships, and were originally battle cruisers. It cost \$40,000,000 each to convert them into carriers. The *Saratoga*, shown in the illustration on page 128, is 888 feet long and 105 feet beam. This is the maximum size that can pass through the locks of the Panama Canal, which are 110 feet wide. It carries seventy-two airplanes, and has a speed of 33 knots (about 37 miles) per hour. It is propelled by electricity, which is developed by generators supplied by oil-fired steam boilers. The amount of electric current produced by this ship is sufficient to light the city of Boston. It is equipped with 8 eight-inch guns, and 12 five-inch guns, besides anti-aircraft guns. It is provided with a catapult for launching planes from the deck, and also with cranes to lower planes to the water's surface. The personnel required to operate the *Saratoga* consists of 1,815 men and 219 officers, and of the latter, 115 are aviators.

It is believed by naval authorities that the aircraft carriers will replace battle cruisers and render the construction of such expensive ships unnecessary. With the increase of the efficiency of the airplane, the carrier will more and more tend to become "the eyes of the fleet."

The War in the Air. One of the principal factors in the development of aircraft was the experience of the several nations during the World War; therefore, this article may well deal with the war period at this point. There was more rapid development of aircraft from 1914 to 1918, under war stress, than would

have occurred in ten years of peacetime life.

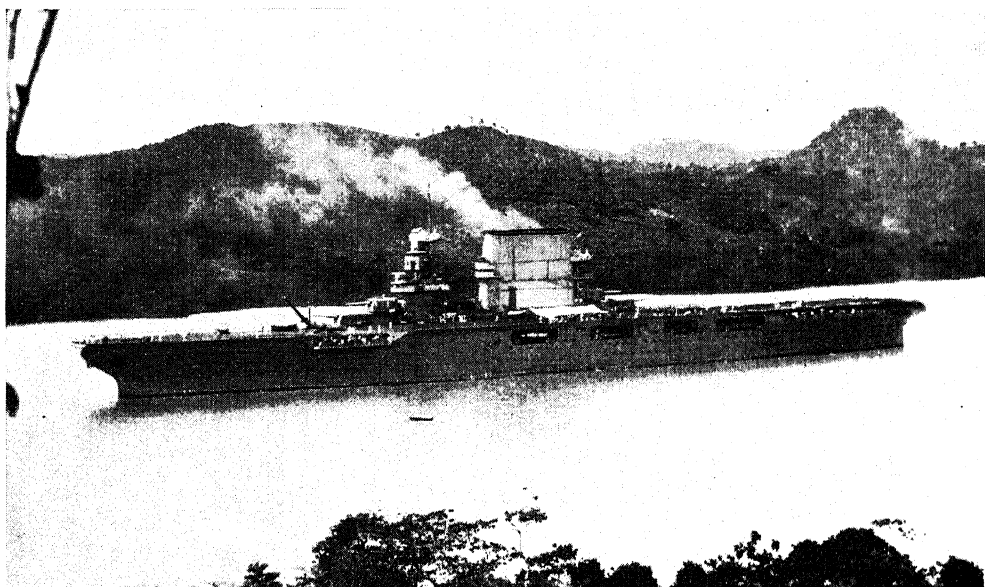
The war in the air was a dramatic chapter in that great conflict. At first used for purposes of observation and examination of enemy positions and territory, the plane became a combat arm, used for both attack and defense. Progress was so rapid, due to the use



WORLD'S LARGEST AIRCRAFT MOTOR

Manufactured by Packard, it develops 1,260 horse power. This form of motor is nearly obsolete.

of unlimited funds and personnel at the disposal of the governments, that modern aircraft may almost be said to be a product of the World War.



THE AIRPLANE CARRIER "SARATOGA"

Photot U & U

The growth in the importance of this branch during the war is shown by the increase in the aviation personnel of the United States forces. When the United States declared war in April, 1917, it had 100 officers and 1,283 men of the army and navy assigned to this department. At its close, less than two years later, the army Air Service had 20,000 officers and 164,000 men, while the navy had 6,716 officers and 30,692 men. The number of planes had increased from 300 training planes, many of inferior types, to 3,300 service planes and 1,600 anti-submarine flying boats.

Airplanes were rapidly improved in design, speed, and efficiency. The modern plane that can stay in the air for forty-eight hours, attain a speed of 200 miles an hour, and ascend to an altitude of 39,000 feet, has largely been made possible by the knowledge gained in military service. Knowledge of flying also was gained by this intensive experience, and rendered the plane an effective weapon. New ideas were advanced and put into practice, such as the Fokker plane, equipped with a gear which enabled a machine gun to be fired through the revolving blades of the propeller; and the Liberty engine, of high efficiency, which was produced in large quantities, with rapidity, and at low cost. New utilities were found to exist, such as aerial photography, artillery observation, attack on ground targets by bombs and by machine guns mounted on planes. Night-flying was conducted on an extensive scale, particularly in defensive operations. In all, there were more than a million hours of flying on the

Western Front alone, and this constituted a vast laboratory for the development of new knowledge of aviation and its problems.

Air Raids. The first use of airships and airplanes in warfare was by the Italian army, in 1912, during the war against Turkey. These machines were used for observation work, photography, bombing, and direct fire with rifles and revolvers. There was no combat in the air, as the Turkish forces had no aircraft with which to oppose these attacks.

In the World War, aircraft were used extensively on the Western Front for fighting and bombing. Fighting in formation was developed to the point where large numbers of planes were engaged. Usually a squadron was arranged in a V formation, or several V's, with three planes in each. The Germans developed the "Air Circus," a plan by which a star pilot had command of a squadron, the pilots of which he was allowed to select. The circus would move to various parts of the battle front for the purpose of attaining air supremacy at a particular location. Aircraft were also used in naval operations for patrolling coasts, torpedoing enemy craft, protecting transports and merchant ships, and combating the submarine. In addition to the work which was a part of the operations on the fighting fronts, air raids were made on towns in France, Germany, and England. London was a major objective in these attacks. Before the defenses were thoroughly organized, the raids were very effective. During the entire period of the war, the number of casualties in England was 1,413 killed and 3,407 injured,

and the property damage was in excess of \$5,000,000. Paris was repeatedly bombed, and sustained severe losses of persons and property.

These raids presented a new problem in warfare, because the victims were usually civilians—often women and children. Civilized nations have acted on the theory that fighting should be done by troops, and that non-combatants should be spared, because they cannot protect themselves nor fight back. Air raids did not confine themselves to military objectives, and hence produced a more ruthless type of warfare than had hitherto been known. The indirect effect of the air raids, too, was considerable. The defense required men and munitions that might have been used at the front, London alone having 200 airplanes and 200 pilots engaged in the city's defense.

Commercial Flying. The developments alluded to above were in the direction of military rather than civil uses. It was necessary that adjustment of the new knowledge should be made to the needs of peace-time air transport. Two major difficulties retarded the commercial development in the United States, neither of which existed in Europe. The first was the fact that preparation is very expensive, and the United States government is opposed to the payment of subsidies or bonuses to companies undertaking this work. In Europe, giving bonuses has been the general practice, and it is justified on the ground that commercial aviation provides both planes and trained pilots that may be needed at some later day for the national defense. The second factor was the great area of the United States. One flying route is 2,669 miles long; Europe, west of Russia, is small by comparison.

But following the war, in all countries, a period of readjustment was needed, during which air transportation companies could be organized, routes laid out, and aviation put on a commercial rather than a military footing. Many of the pioneer efforts failed, owing largely to a lack of terminal facilities, lighted routes, and sufficient patronage. The public was not yet ready to adopt flying as an accepted mode of transportation. New planes had to be designed for the specific purpose for which they were required; engines had to be further

improved, to render their performance less subject to failure; methods of navigation had to be developed, to render air transport safe and certain; radio communication had to be adapted to flying; beacon lights had to be installed; weather bureaus had to be enlisted in the service, to furnish complete data on atmospheric conditions; and regulations were required to insure proper standards of plane construction, pilot proficiency, and methods of operating commercial routes.

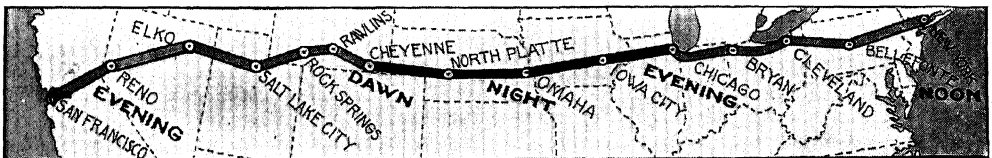
The Air Mail. In the United States, the first substantial air achievement was the permanent establishment, in July, 1924, of the transcontinental air mail. The service had been tried out in 1923 and found entirely feasible, and in the interval all plans for the success of the enterprise were perfected. Sixty airplanes were allotted to the service, with twenty others in reserve in cases of emergency.

The schedule required that the mail be carried from coast to coast, westbound, in 34 hours 45 minutes; eastbound, in 32 hours 5 minutes, thus cutting more than sixty hours from the fastest train schedules. Favorable winds eastward accounted for the difference in time.

For nearly one-third of the distance of 2,669 miles, between Chicago and Cheyenne, flight is by night. Pilots along this stretch are guided by exceedingly powerful lights. There are emergency landing fields about twenty-five miles apart; every 250 miles there are regular landing fields, equipped with lights so powerful that when they are turned directly toward the aviator, their arrows of light are visible over a hundred miles. Flight through the first and third zones is by daylight; good visibility is especially required in the mountain area.

The aircraft which the air-mail service utilized at first were De Haviland biplanes, equipped with 400-horse-power Liberty engines, each capable of carrying 500 pounds of mail, or approximately 26,000 letters. Each ship was equipped with two 250,000 candle-power wing-tip lights, in addition to the red, green, and white navigation lights.

There were originally three zones for postage rates; the first, between New York and Chicago; the second, between Chicago and Cheyenne; the third, extending from Cheyenne to San Francisco. (See page 131.)



ROUTE OF THE TRANSCONTINENTAL AIR MAIL

Cut into the portals of the New York postoffice are these words: "Neither snow, nor rain, nor heat, nor gloom of night stays these couriers from the swift completion of their appointed rounds." Reference was to postal employees, and not to air mail pilots, for the words of praise were fashioned before the invention of the airplane. However, the sentiment applies with particular force to the indomitable pilots of the air service.

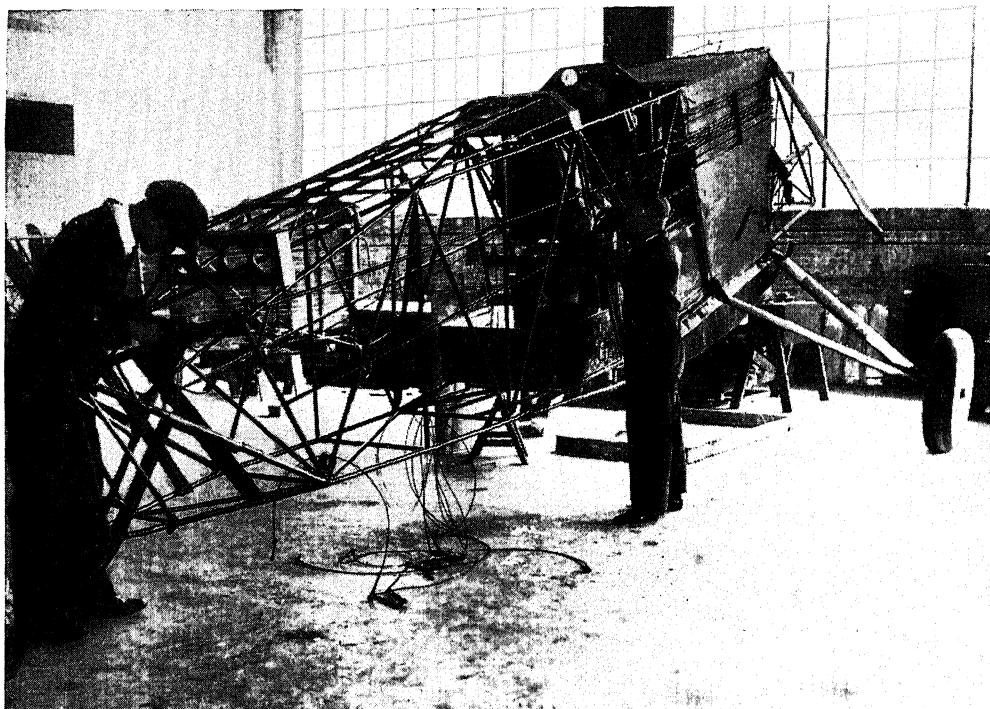


Photo: National Air Transport

REBUILDING THE FUSELAGE OF AN AIR-MAIL PLANE

It will be noted that all the framework is metal, and that the parts are welded solidly together.

In comparative terms, one hour of the flight of the mail along the route corresponds roughly to a day of the pony express of sixty years ago. The New York morning papers may be delivered in San Francisco the day after publication. In terms of hours, San Francisco is now no farther from New York than was Philadelphia a hundred years ago. The present flying schedule between New York and San Francisco is 32 hours.

Table Shows Progress. The following tabulation illustrates the progress made by the United States postal service within the last seventy-five years in shortening the time required to send a letter from New York to San Francisco:

- 1850—Three days by rail and twenty-one days by stage.
- 1860—Two and one-half days by rail to Saint Joseph, Mo.; eight days from there by pony express.
- 1876—One hundred hours by special train.
- 1923—Ninety-one hours by train.
- 1928—Thirty-two hours by air mail.

The first air-mail service was inaugurated on May 15, 1918, when an air line was opened between New York and Washington.

The establishment of this route made successful commercial aviation possible between these cities, because it insured a steady income to the operating companies from the payments for carrying the mail.

The Air Commerce Act. Before great progress could be made, however, it was necessary to have some form of control to set up standards for planes and pilots, and to determine air routes. Two plans were advocated: one, that a Department of Aviation should be created, under a Secretary of Aviation, who would be a member of the President's Cabinet; the other, that aviation should be supervised by the existing departments of War and Commerce. A plan was finally worked out which was a compromise, and which has been very generally approved. The Air Commerce Act, passed in 1926, provided for the appointment of three new assistant secretaries in the departments of Commerce, War, and the Navy, to have direct charge of the development of commercial aviation, working in harmony with the military and naval establishments.

In general terms, the Air Commerce Act provides that the same essential services shall be given to navigation of the air which have been provided for over a hundred years in navigation of the water. It authorizes the registering of eligible aircraft, certifying to their air worthiness, examining the operating personnel and air-navigation facilities, and of establishing air-traffic rules.

It authorizes airways, provides for lighting, mapping, and emergency landing fields, and

in other directions furnishes assistance to aviators, such as radio-direction, fog-protection facilities, weather information, and other aids to navigation.

The purpose of the government has been threefold: first, to secure better development of this new form of transportation for commercial purposes; second, to create private commercial services which can relieve the Postoffice Department of its direct expenditure upon air mail; and third, by the creation of a large commercial air fleet, with its accompanying personnel and its background of the manufacturing industry, to give a fundamental military reserve to the country.

Since the passage of this act in 1926, the progress in all branches of aviation has been amazing. The air mail has increased rapidly, many branch lines having been established to connect with the transcontinental airway. The number of pounds of air mail carried in 1928 was 4,061,210, for which the operators received in compensation, \$7,433,166. This figure shows the extent to which the air mail has been a source of support to the aviation industry. In the same year, more than 10,000,000 miles were flown by air-transport operators with regularity and a high degree of safety.

The large volume of mail carried in 1927 made it possible to reduce the postal rates from those originally established. On July 1, 1928, a schedule was adopted which abolished the original zoning system and fixed a rate for letters of five cents for the first ounce and ten cents for each additional ounce. It then became possible to send an ordinary letter from New York to San Francisco for five cents. Rates on parcels were also reduced about fifty per cent. A survey in 1930 disclosed the fact that 72,000,000 people in the United States were at that time directly reached by air-mail service.

Many of the mail lines carry express, and a few carry passengers. Passenger traffic has not been especially sought by the mail carriers, as they prefer to allow the demand to grow naturally. When passengers are carried, especial care is used to insure their safety. If adverse weather develops, passengers are landed and carried by train; the passenger pays only the regular rail fare, in such a contingency. In these cases, the pilots almost invariably proceed with the plane, and usually they get through on schedule time.

It seems highly probable that commercial aviation ultimately will be divided into two main divisions—passenger and freight. In the former, safety and comfort will be especially considered; in the latter, speed and regularity. Several leading railroad systems have entered the field of transcontinental passenger traffic

by air. Passengers fly during the day, and are transferred to trains at night.

Airplane Routes. Since 1927 the United States has made such rapid strides that it bids fair speedily to overtake Europe, which until then had maintained supremacy.

In a survey of each continent, one factor is seldom considered. The United States has a vast area—one flying route is 2,669 miles long; Europe, west of Russia, is small by comparison. Were all the regularly established American routes confined within an area as large as England, France, Holland, Belgium, and Germany—where air service is most highly developed—America's advance would appear rather startling. However, the United States thus far has limited its enterprises of the air largely to the carrying of mail, freight, and express; there are about ten lines giving passenger service. In any study of comparative development in the two continents, it must be noted that the American government does not offer encouragement in the form of subsidies to air pioneers.

Early in 1930 there were sixty-two air routes in regular operation in the United States. Encouraging facts are derived from the history of flights of some of the companies. For example, the Robertson Aircraft Corporation made 219 single trips out of 220 on its schedule; the Florida Airways Corporation, on a route newly chartered, maintained for its first six months an operating efficiency of 97 per cent; the Western Air Express during about the same period did not record a forced landing by any pilot.

The regular air lines so far authorized in the United States cover over 25,300 miles; the mileage of all scheduled flights in a year reaches a total of nearly 60,000,000.

Providing Local Facilities. The interest on the part of many cities in providing air-transportation facilities is comparable to the desire of the early pioneers to obtain railroads for their communities. An idea of the widespread interest in aviation and the variety of its phases may be gained from a glance at a few of the news items of the kind that are appearing almost daily in the newspapers.

Item one: the installation of a new aerial light on top of the Roanoke tower in Chicago. It consists of two rotating searchlights of 8,000,000 candle power each. Congress has approved a light of 2,000,000,000 candle power on top of a 38-story building in Chicago.

Item two: Germany completes its mighty Dornier flying boat, the DO-X, with twelve motors; it has a lifting capacity of fifty-two tons, and will carry 170 passengers.

Item three: a safety competition was instituted by Daniel Guggenheim, in which prizes aggregating \$150,000 were offered for a safe type of airplane.

Item four: the University of Minnesota has added a four-year course in aeronautical engineering, leading to a "flying" degree.

Item five: Doctor Fridtjof Nansen announced an extended polar flight for the sole purpose of making detailed meteorological researches. Atmospheric conditions at the poles have an important influence on agriculture and transportation.

Item six: Night travel is to be made safer by the government. Radio controls and beacon lights are to be installed along all national air courses.

The large amount of attention which the press is giving to aviation items shows a quickened public interest, and reveals effects which aviation is having upon our living and our thinking.

Safety of Air Travel. Probably no phase of aviation has been more discussed or more in the public mind than that of safety in the air. Many accounts of accidents have appeared in the daily press, and an impression prevails that flying is one of the most hazardous of all enterprises. Yet there are surprising figures which show the contrary. In the mail service there is now only one fatality in about 1,500,000 pilot miles; and in commercial transport the average is one to 775,000 pilot miles. British air men show a record of 5,000,000 miles in seven years with only four fatal accidents. Germany carried 56,268 passengers in one year with only one fatality. In the early days of railroading, there was much the same feeling in regard to the dangers of travel by rail. A paper published in London in 1842 stated that during the previous year the number of passengers carried on eight railroad lines was 10,508, and that of this number only fifty-six were injured, of whom twenty-two died.

The chief danger in air travel is that of forced landings necessitated by a failure of the motive power. These are being so lessened, with the improvement in airplane motors, that this hazard is a vanishing factor in the problem. Many of the accidents are due to experimental work, where hazards are incurred deliberately in order to demonstrate some fact needed in regard to construction or operation. Such work is the necessary price of progress in this new science, and aviation as a whole will profit by it.

Weather. Another critical factor in flying is the weather. Sudden atmospheric changes may produce difficulties which even the most experienced pilot cannot surmount. Commander Richard E. Byrd gives an account of such a happening in his story of the *America's* flight to Europe in 1927 (see Commander Richard E. Byrd's *Skyward*).

A most terrible experience in my life was the two thousand miles we spent storm-tossed

in the *America* on our cross-ocean flight without seeing ground or water beneath us, followed by hours of a similar experience in a storm at night over France.

I think my companions cheerfully subscribe to this statement. For over twenty-four hours of that flight we saw nothing whatever beneath us. I sincerely hope no other fliers ever have that experience.

Hour after hour the notations in my log of that journey declare it was utterly impossible to navigate. We could not tell which way the winds were blowing, which way we were drifting, or what sort of land or water was below us.

Our chief safety lay in watching our instruments closely, so that we should not be carried so close to the surface of the land or sea that we might crash without warning. Had we done so, we should have been killed instantly. Our lives hung on our altimeter.

As night closed in, we could not even see the ends of our wings. At this critical time there was a leak in our gasoline tank.

I mention these points not to emphasize the hazards of such a flight, but because I wish to lay stress on the peculiar nature of the perils and show how far they were removed from normal conditions of flying.

We were traveling in a territory as new as the dreaded polar regions were to Hendrick Hudson and his tiny vessels four centuries ago.

Once when we fought our way above the fog around 10,000 feet, we came out upon a weird view. Towering peaks of vapor surrounded us. Below was a gray murk that clutched at our plane. There was no horizon.

It is necessary that an ocean flier know meteorological conditions for each zone through which he will pass, before he reaches it. He must know the barometric pressure and the temperature for various altitudes. Fog and cloud conditions are equally important.

Study of air disturbances is a life work in itself. Gradually we are becoming more familiar with the general movements of those of the North Atlantic.

Byrd's Atlantic flight experience shows that knowledge of weather conditions is of the utmost importance to the pilot. By means of radio, this information can be supplied while the plane is in the air. Undoubtedly such information will be regularly supplied on all transport lines in the near future. (See account of Byrd's flight, later in this article.)

The Human Equation. The training of pilots is essential to safe air navigation, and is beginning to receive careful attention. The majority of present-day pilots received their training in the army or navy, but the future needs in commercial flying will require additional sources of training. Several private schools have undertaken this work, but they have had difficulty in giving enough cross-country work in different types of planes. The air-transport companies require a minimum of 500 hours of flying, as well as some

experience with the mechanics of airplanes, for all the pilots they employ. There is more demand for mechanics than for pilots; for these positions, men who have had experience



Photo: U & U

FLYING IS NOT ALL ROMANCE

Disaster and death sometimes fly with the most experienced pilots. Favoring winds may give way to cyclonic forces; fog may become impenetrable; the humming motor may fail to function; a safe landing place may be too far distant. The machine pictured above fell to the earth in New Jersey in a nose dive from a height of 400 feet.

in airplane or automobile factories are preferred.

Colonel Charles A. Lindbergh, a trustee of the Guggenheim Fund for the Promotion of Aeronautics, has made the following statement in this connection:

There are many schools which advertise that they will teach a novice how to fly an airplane. Some of them give the course for \$100, usually turning out the student as a finished pilot after about ten hours in the air. Ten hours will not make anyone a pilot, and \$100 will not buy a good course of training. The man or woman who wants to become a pilot should be prepared to spend at least \$500 for the training, and some agreement should be reached whereby the use of the plane for practice may be obtained after the course has been completed. A great many serious aviation accidents occur because of pilots who are turned out of cheap schools, without sufficient experience to meet emergencies.

The importance of the human factor in

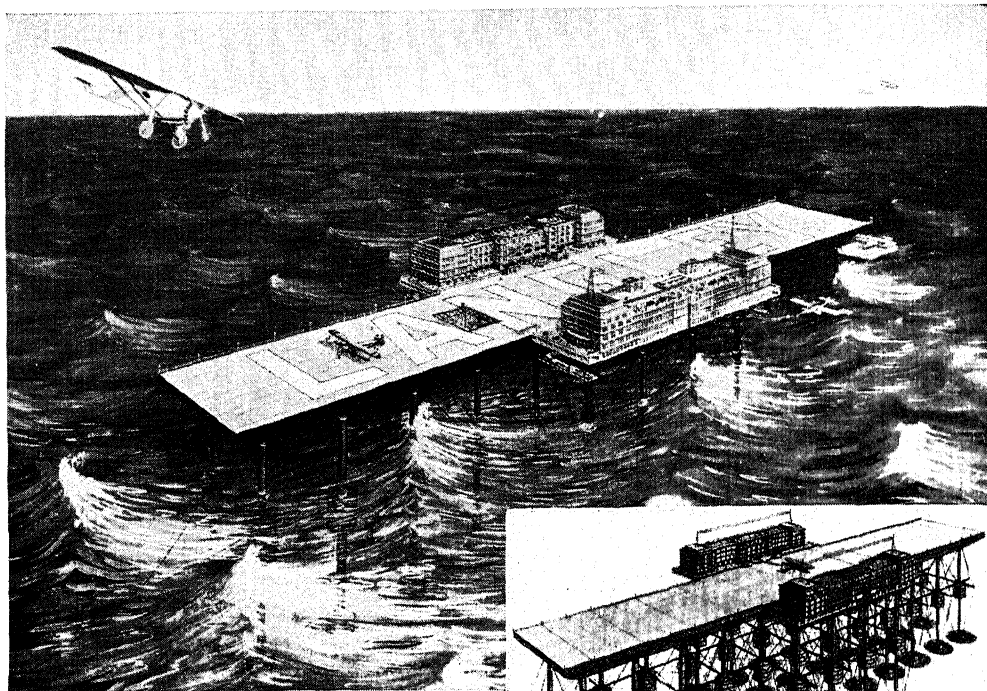
flying is thus presented by Chas. J. V. Murphy in *Harper's Magazine* (July, 1928), in an article, "Shall We Fly the Atlantic?"

What Lindbergh knew then—what Byrd, Chamberlin, Noville, Balchen, and Acosta knew—was that ambition and courage are not sufficient to guarantee success. These men had poured months of labor and study into meeting the problems of their flight. But at best it proved little more than primer book-learning when they confronted the actualities of an ocean-crossing by air; the ear-deafening, mind-deadening harmony of the motor; the unending fight to keep sleepy eyes upon instruments hour after hour; the strain of holding to a course and watching, ever watching, the half dozen vibrating needles that bridge the gap between life and death; the pitiless cold and the threat of ice-forming sleet. They learned how all-important was the human element in the equation. Even a perfect motor could not alone bring success if the human mind failed in its terrific task.

For ordinary flights, the pilot can fly by "dead reckoning," that is, he can check his course by observation of objects which have been represented on a map, and by a record of his true speed and his course according to the compass. But special conditions may arise when the pilot must fly "blind," that is, using instruments alone, without being able to see the horizon, the altitude of heavenly bodies, or any objects on the ground.

Numerous instruments have been contrived to furnish the needed information, such as, the altimeter, which determines the height above the earth's surface; the speed indicator, which shows the speed of the aircraft relative to the air; the aircraft compass, to show direction of flight; the turn indicator, to show whether flight is being maintained in a straight line, or if turning, the direction and rate of change of the course; a tachometer, to tell how fast the engine is turning; and a thermometer, which indicates the temperature of the lubricating oil. Add to these a radio set and the "controls" of a ship, and you will see that a pilot has plenty to keep him busy.

Of course, to a certain extent, flying becomes instinctive and automatic to the experienced pilot. He does not have to give conscious attention to all these matters at once. Just as in driving an automobile, he becomes so accustomed to certain manipulations that they are performed without mental effort. Flying is slightly more complicated, because the machine responds so readily to its controls, and because the control of an airplane is three-dimensional—forward, up or down, to left or right. Landing and taking off are likewise highly technical maneuvers, and require the greatest care in execution. Only practice can make perfect in the complicated but fascinating art of air navigation.



PROPOSED MID-OCEAN AIRPORT

In 1928 it was announced that construction of the first "seadrome" on the Atlantic Ocean had been begun. The report proved to be premature, but it called attention to the fact that air-minded men are busy with problems concerning trans-Atlantic air navigation. The plans under consideration for airports at sea contemplate one landing place about every 500 miles; for the one illustrated above, the specifications provided for a length of 1,200 feet and a width of 400 feet. At each "seadrome" there will be an airplane service station, a hotel and rest room, and radio equipment. The cost of each of these ocean floats is estimated at \$1,500,000. In the smaller picture, the floats which support the structure are shown.

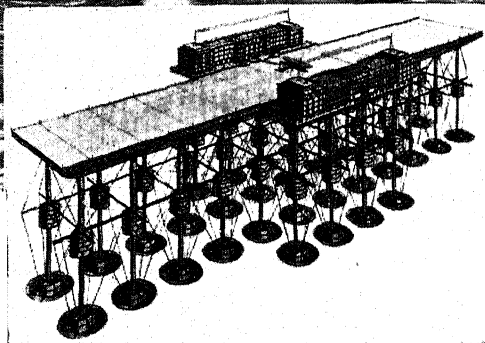


Photo: U. S. C.

An Air-Minded World. Air transport is rapidly becoming an accepted part of our daily lives. Probably it will not supplant other forms of transportation, but because of the great speed which it makes possible, it will greatly influence our ways of doing business and our mode of living. Speed is regarded by many as a useless or even a foolish objective, yet rapid and efficient transportation and communication have always resulted in a higher state of civilization. Of course, speed is not an end in itself. A witty observer once remarked that "Americans are busily engaged in going nowhere in particular in a terrible hurry." Even the radio has been said to be an instantaneous means of transmitting rather unimportant ideas and events. But there is another side to the question. There are times when speedy communication and transportation are of the utmost practical value. In fact, the objector would find it difficult to convince us that a longer rather than a shorter time would be preferable for the delivery of our letters. The following

instance shows the value of commercial air transport:

A steam shovel working on a dam broke down, and it was necessary to replace one of its parts. The nearest place where the part could be secured was New York. An order was placed, and the request made that shipment of the part be made by air mail. The necessary part arrived on schedule time at a saving of three days over ordinary means of transportation.

Each day the steam shovel was out of operation was costing the construction company \$350. Hence, the saving of three days of time resulted in a saving to the company of \$1,050. This saving was accomplished by the expenditure of \$3.51 for air-mail postage.

Another example was the shipment by the Crane Company in Chicago of six flexible joints weighing 318 pounds to the Baker Iron Works, Los Angeles. The cost of shipping this material by air express was \$718, but the saving in transit time more than compensated for the high cost, as production of a

moving picture by the William Fox Productions had been suspended pending the arrival of the joints. The expense of this delay amounted to many thousands of dollars daily to the film company. The joints were for use in equipment for making pictures of a bareback rider in a circus production.

Facts of this kind show that the air mail is revolutionizing many phases of business communication in all parts of the country. They show that ease of communication and transportation is a definite business asset.

Passenger Traffic. Many of the air transport companies began their passenger service by carrying passengers in their mail planes. The safety and regularity of the air-mail schedules caused a rapid increase in the demand for passenger accommodations. As a consequence, planes built for this traffic were soon provided on all the principal lines.

The time tables issued by the various air lines are similar to those printed by the railroads, except that a schedule of the rates of fare is included, since these are much higher than railroad fares.

Airports. In order to make air transport generally available, it is necessary that as many cities as possible be provided with airports. These are usually equipped by the municipality, since commercial flying is beneficial to all the general public. The illustration shows a typical airport.

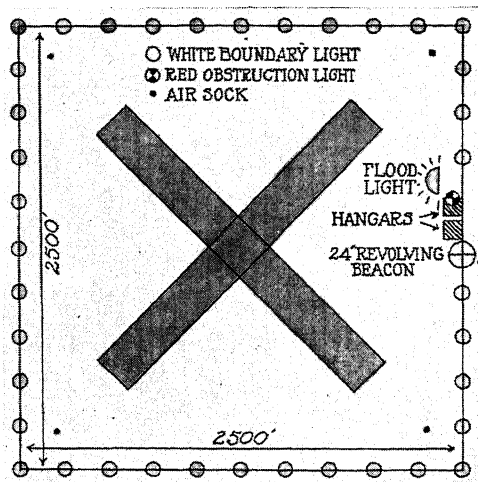
The field should be approximately one-half mile square, level, and free from holes or obstructions. This would give a runway about 2,500 feet long, for taking off or landing. Adequate drainage is essential; all low places should be filled in, and tile drainage supplied, if necessary. Lights should be provided around the entire field at intervals of 250 feet. By this means, a pilot using the field at night can get a very definite outline of the airport. A beacon light of high candle power directs the pilot to the field. It is set at an angle of two degrees to the field and revolves eight times a minute. A flood light is also necessary, to provide illumination for landing or taking off. It should be so placed that it will not blind the pilot, as its intense light cannot be faced directly.

All buildings or other structures should be marked with red lights. These are called obstruction lights, and should be placed on smoke-stacks, electric poles, or wires, or any other obstructions bordering on or adjacent to the field.

Any municipality providing an airport complying with these essential requirements will have met the needs of commercial aviation very satisfactorily.

Airways. The installation of beacon lights along established air routes is necessary to make night flying possible. The Airways

Division of the United States Department of Commerce has general supervision of this work. The beacon consists of 24-inch revolving lights, mounted on towers fifty-three feet high. They are placed at approximately ten-mile intervals, and are equipped with 1,000-watt bulbs. An interesting feature is the automatic lamp changer. In each beacon there are installed two bulbs—one in use and one kept as a "spare." Whenever the bulb



ONE TYPE OF LANDING FIELD

The shaded cross represents runways by which an airplane may enter the field from any one of four directions, the choice of runway being determined by the direction of the wind. The wind current is disclosed by the air sock, a large cloth contrivance shaped not unlike a long stocking, which the wind blows toward a horizontal position.

in use burns out, an automatic device brings the new bulb into use and preserves uninterrupted service. Power for the beacons is furnished either by local power companies or by means of lighting plants installed near the base of the tower. In addition to the beacons, there are installed along portions of the route acetylene flashing beacons. These are placed at points where unusually bad weather conditions are frequently encountered. They are placed at intervals of two and one-half miles between the revolving beacons.

At each beacon there is shown in six-foot letters the route number and the beacon number. The numbering system is so arranged that the addition of a zero to any beacon number will give the number of miles it is located from the end of the route. Also, at each beacon there is a directional arrow which points along the general line of flight. This arrow is directly under the beacon tower, and is 56 feet in length. On the feather end of the arrow there are painted the route

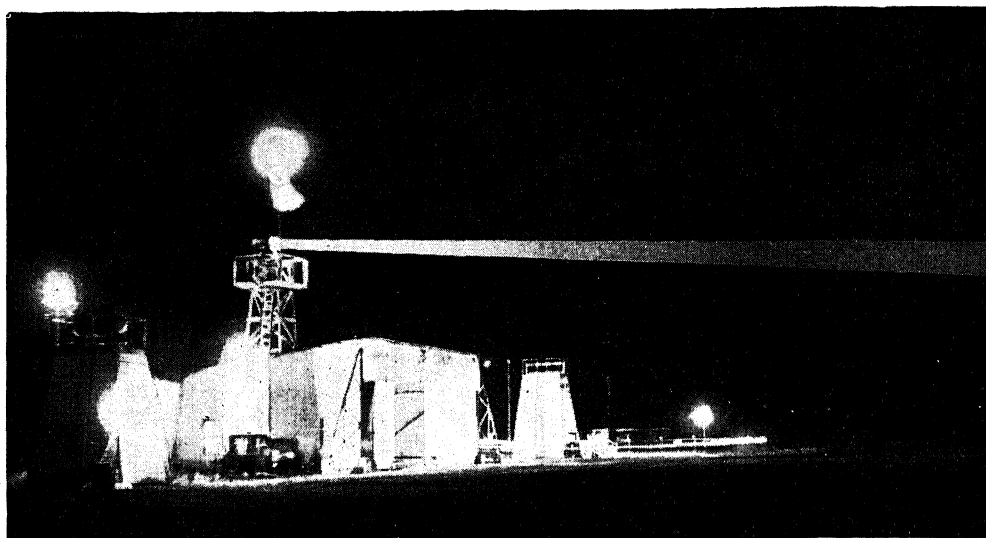


Photo: National Air Transport

BEACONS WHICH DIRECT PILOTS TO AN AIRPORT

letters and beacon number in black on a chrome-yellow background.

Beacons which are fed from power-line extensions are provided with an automatic means of being turned on and off. This may be a sun valve or an astronomic clock. The latter is wound and set automatically by electricity, and will turn the lights on and off at sundown and sunrise throughout the changing seasons, whatever the length of day or night may be.

Airways are also provided with emergency landing fields about thirty miles apart. Each field is lighted by a system of boundary lights, placed 250 feet apart around the usable portion of the field. These fields are rented by the government from the local owners, and an effort is made to locate them as near to public utilities and land transportation as possible. A caretaker is employed, who looks after the operation of the beacon and boundary lights and such other equipment as may be installed.

Dispatching Service. In order to give the airplane pilot complete information about the weather conditions along his course, a system of radio communication is maintained by the government on all lines carrying the air mail. For this purpose the routes are divided into divisions and sections. The emergency landing fields in each section are connected by telephone with the nearest division headquarters. The main terminals are connected by radio. By this system the various field managers are constantly informed of the weather conditions along the entire route. If a pilot encounters severe weather, he can land at an emergency field and find out whether the condition is purely local or whether

it affects his entire route. In the latter case, he will remain where he is, in order to avoid the impossible conditions. This system of communication protects the pilot, the plane, and the shipment. However, pilots will soon fly in heavy fog, guided only by instruments.

The results which are being attained by the commercial air lines are most gratifying. One of the companies, which carries the mail from New York to Chicago and from Chicago to Dallas (National Air Transport, Inc.), reports that in a period of two years, including two full winters, the mileage flown was 2,334,399 miles, and the amount of mail carried was 591,000 pounds. During this entire period there was but one fatality.

The increase in the air-mail service is a testimonial to its reliability. In 1918 the Postoffice Department inaugurated the first air-mail service between New York and Washington, a distance of 245 miles. By the year 1930 the air-mail routes of the United States had a mileage exceeding 10,000 miles, with thirty-one separate contract air-mail routes, maintained by seventeen different air-transport companies.

Flying in Europe. Transport by airplanes in Europe has become an established mode of travel. From numerous centers one can fly over long routes, and by connecting links can reach almost every part of the continent. From Paris a person is able to travel by airplane over a regular commercial passenger line to any one of nineteen capital cities. These airlines cover Europe almost in the fashion of a spider's web. The planes are fast and comfortable, and what is more important, they are safe.

The international lines from Paris lead to

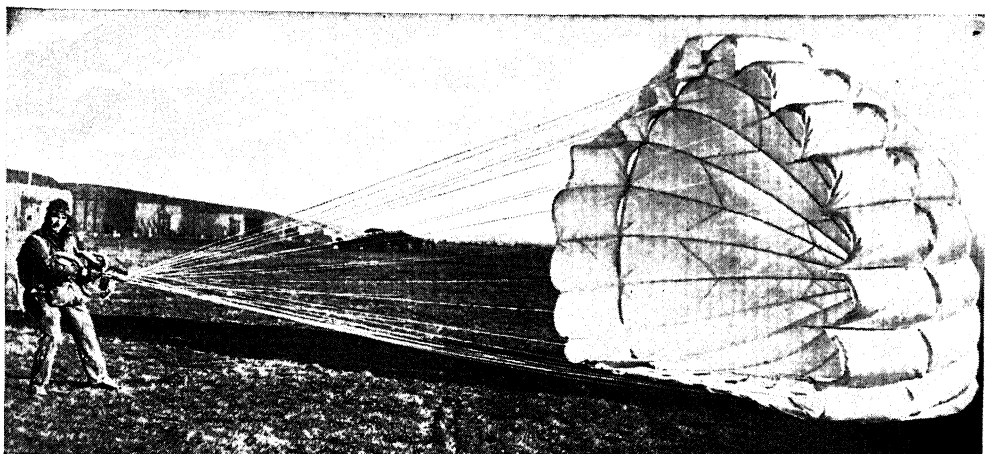


Photo: U & U

LANDING AFTER A PARACHUTE JUMP

London, Amsterdam, Brussels, Berlin, Copenhagen, Riga, Reval, Helsingfors, Memel, Moscow, Warsaw, Prague, Zurich, Budapest, Belgrade, Bucharest, Constantinople, and Ankara.

For example, from Paris to Marseilles, on the Mediterranean Sea, is a comparatively short flight; from there one easily can make air connections for Tangier and the cities in French Morocco.

All who worship the god of speed should be interested in airplane travel in Europe. Paris is only eight hours from Berlin by airplane, though twenty hours away by rail; and two hours from London, though seven and one-half by rail and water. Constantinople is three days closer to Paris by air than by rail. Fares have gradually been decreased to such a point that in numerous instances they are only slightly higher than rail tariffs. All lines in Europe receive subsidies from their governments.

In 1929 Great Britain completed two giant airships of the Zeppelin type, the *R-100* and *R-101*, more than 730 feet long, each costing about \$5,000,000. They possess luxurious appointments for the comfort of passengers.

Air travel in Europe is proving so popular that reservations for passage usually must be made several days in advance. The reports of those who have had the experience of touring Europe by air are highly laudatory. They indicate that the routes are as accurately mapped, schedules as rigidly kept, and terminals as carefully supervised as in the most up-to-date railway system. Most of the planes used are of the tri-motored type, with accommodations for eight or ten passengers.

The First Ocean Liner. On October 15, 1928, the giant dirigible *Graf Zeppelin* reached the United States after a memorable journey of 111½ hours from Friedrichshafen, Germany. This was the first time in history that an air liner made an ocean trip with passengers and demonstrated the commercial practicability of air travel between Europe and America. The ship carried twenty passengers, of whom

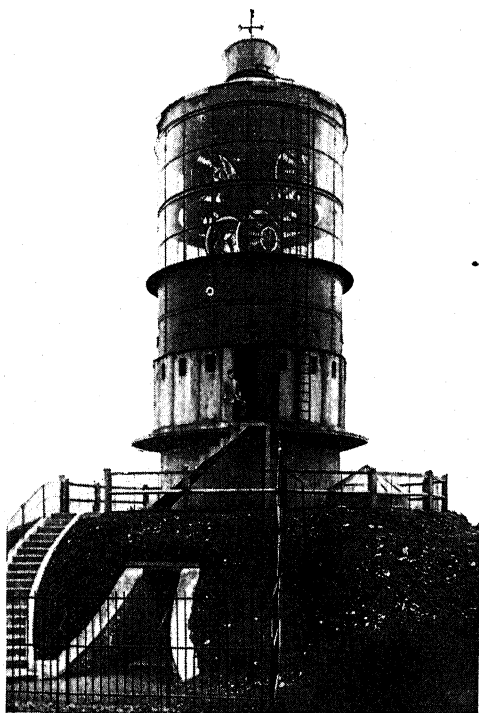


Photo: Wide World

EUROPE'S MOST POWERFUL LIGHT

A billion candle-power aviation beacon, on Mount Afrique, France. At night the light is visible for three hundred miles.

There are connecting lines leading to other cities from most of these political centers.

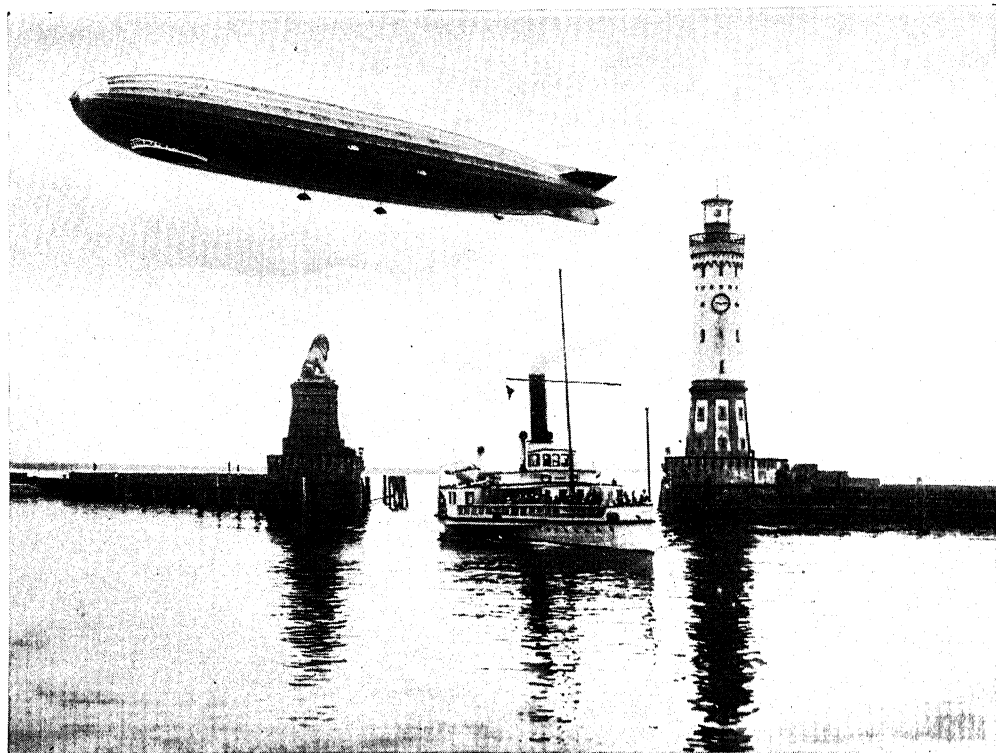


Photo: U & U

THE GRAF ZEPPELIN, MAJESTIC MONARCH OF THE SKIES

It circled the earth in 21 days, 7 hours, 33 minutes; flying time, 11 days, 23 hours, 14 minutes.

only one was a woman, Lady Grace Drummond Hay. The crew consisted of forty men.

Unfavorable weather conditions over the Atlantic made a long detour necessary. By turning south over Gibraltar and the Madeira Islands and then north over the Azores, the distance covered on the trip (6,300 miles) was almost double what it would have been under more favorable conditions. It is worthy of note that the troubles encountered were solely due to the weather and not to the failure of any part of the ship's mechanical equipment. Count Eckener was in command.

Less than a year later, in August, 1929, the same vessel made its second flight to the United States, and with favorable weather cut the flying time to ninety-five hours. Its destination was Lakehurst, N. J. From this point the *Graf* started on a trip around the world, with few stops scheduled—at Friedrichshafen, Tokio, Los Angeles, and again, Lakehurst. The voyage was made successfully in the time noted under the illustration above. Nineteen passengers paid \$9,000 each for the trip.

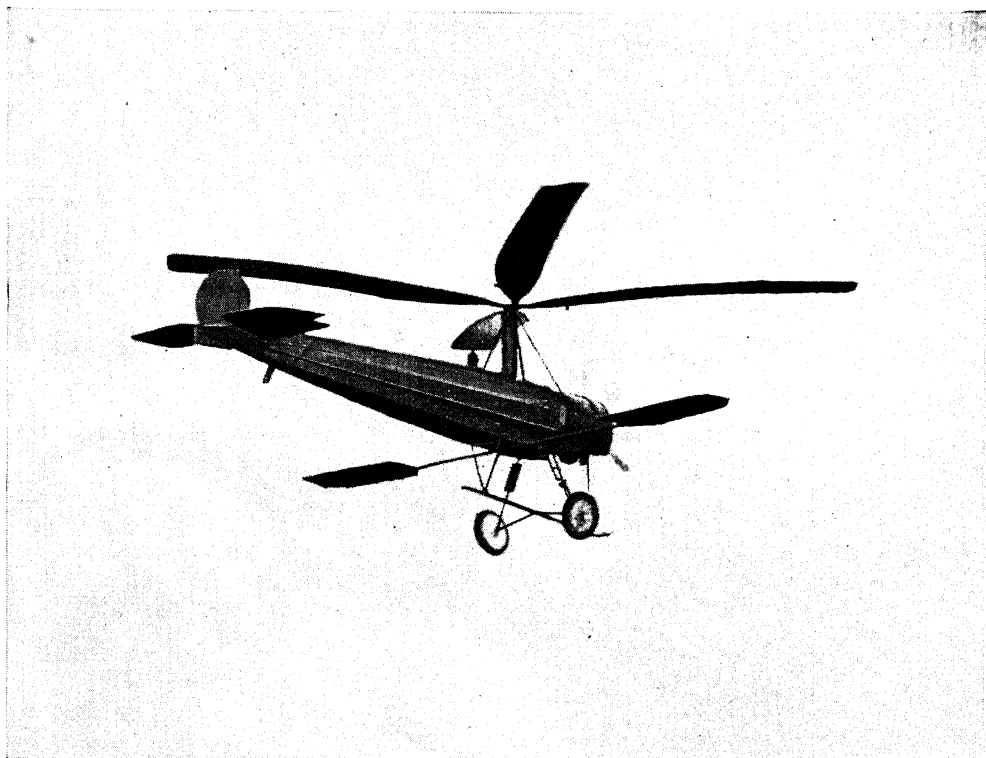
Complete radio equipment and apparatus for receiving weather maps are conspicuous features of the great dirigible.

The Helicopter. This form of airplane is designed for the purpose of enabling it to rise and descend almost vertically. The propeller is mounted in a horizontal position, usually on top of the craft. This propeller may be used as a substitute for the customary wings and propeller, or it may be employed to supplement them.

The advantages claimed for this type of plane are: (1) the ability to take off from and land in a small area; and (2) the securing of the necessary lift for the plane without rapid forward motion. These qualities are very desirable, and have always been striven for by airplane designers. The helicopter does not fully attain them, because the lifting force of a horizontal propeller is small in proportion to the power expended; hence it has not been found possible to develop enough power in relation to weight to make this device practicable.

The helicopter is still in the experimental stage. Thus far the results have not made much of a contribution to the science of air navigation. The problems which it involves seem more difficult of solution than in the case of the usual type of airplane.

The Autogyro differs from the helicopter in that the horizontal propeller is not driven



FIRST SUCCESSFUL AUTOGIRO

Photo: U & U

This is the machine perfected by Juan de la Cierva, and while popularly called a helicopter, it differs from that machine. The points of difference in the two machines are made clear in the accompanying text.

by the engine but is set in motion by the wind-stream when the craft moves forward. The autogyro has small wings, resembling paddles, on each side, but it is supported chiefly by the "windmill" which is mounted horizontally above the center of the fuselage. This structure consists of four narrow wing sections rotating about an axis.

A successful flight in an autogyro was made

across the English Channel in September, 1928, by Senor Juan de la Cierva of Spain, the inventor of the craft in which the flight was made. The horizontal propeller of this machine had four blades with a total area of 160 square feet. The rate of revolution was 135 per minute. Later, in Paris, the craft crashed to the earth, but without injury to the aeronaut.

First Great Feats in Flying

Pioneer work in a new field often involves experiments which seem merely spectacular and of slight practical use. But many events which are regarded by the public only as performances develop knowledge which is very useful when added to the things already known. From the beginning of aviation in 1903, contests have been held to establish records for speed, distance, and reliability. These contests have been the means of discovering mechanical weaknesses in engines and planes, and have enabled engineers to make needed improvements. The earliest speed record was made by Santos-Dumont of France in 1906. His record was twenty-five miles an hour.

Ten years later the record was 126 miles an hour, and the next decade brought the figure up to 281 miles an hour, with unofficial figures of more than 300 miles.

At the close of the war, the longest non-stop flight that had been made by an airplane was 1,350 miles, in 24 hours 12 minutes, by Reinhold Boehm. Ten years later the record for duration in the air was 65 hours 21 minutes made by the German fliers Risticz and Zimmerman. They used a one-motor Junkers plane, and flew a course back and forth between Dessau and Leipzig.

Various records were made for the longest airplane journey, but they were all eclipsed

and a final mark was set in 1924 when the United States army fliers circled the earth in the flight described below.

The first crossing of the Atlantic was made by a United States naval plane, the *NC-4*, in May, 1919. This trip included several stops. The first non-stop Atlantic crossing was made by two British aviators, Captain John Alcock and Lieutenant Arthur W. Brown, who flew from Newfoundland to Ireland, 1,960 miles, in June, 1919.

The official record for the highest flight in an airplane is that of Lieut. Apollo Soucek of the U. S. Navy, who reached an altitude of 39,140 feet on May 8, 1929.

Early Cross-Continent Trip. After luncheon one day in May, 1923, Lieutenants MacReady and Kelly of the United States army flying corps "hopped off" in their airplane from Roosevelt Field, Long Island, and they landed on the Rockwell Field, San Diego, Calif., in time for lunch the next day. At an average speed of 100 miles per hour, their big monoplane, designed by the Dutchman Fokker (who made Germany's best planes during the war), powered by a Liberty motor and redesigned in part by American experts, covered 2,700 miles in a single flight in a little less than twenty-seven hours. This achieved the world's non-stop record at that date.

A new transcontinental record was established by Lieutenant Russell L. Maughan, of the United States army, in June, 1924, after two previous failures which had left him undaunted. The morning after the longest day in the year he started from Mitchell Field, Long Island, at three o'clock, as the light of the coming day was dissipating the mist and the darkness; after 18 hours 26 minutes of flying time his motor roared out of the east; he landed in San Francisco as the last streaks of light were fading from the western sky. He spanned the continent in less than a day, had traveled a distance of 2,680 miles, and had driven his airship at an average speed of 156.2 miles per hour. [In 1929 Captain Hawks reduced this time to 18 hours 11 minutes 59 seconds].

Lieutenant Maughan flew alone; he had neither assistant nor mechanic. Highest praise was accorded the flier, and none was more generous than that bestowed on him by the chief of the Army Air Service:

Engines and fuselages and wings can be standardized, but the man who drives a plane at high speed from the Atlantic to the Pacific for eighteen and a half hours, and who knows exactly what he is about every minute and mile of the way, is a rarely complex and efficient organization. Nature produces few such men.

Around-the-World Flight. Six highly trained aviators belonging to the United States Army Air Service achieved in 1924 the distinguished honor of having been the first men

to fly around the world. Many other men in coming years will probably accomplish the circumnavigation of the globe in shorter time and with less discomfort; all future air history, however, will but emphasize the supreme triumph which goes to the American "trail-blazers," the modern "Magellans of the air."



Photo: P & A

CONSTRUCTION OF HANGARS IN CHINA

As would be expected, the framework is made of bamboo.

The purposes of the flight were to demonstrate the feasibility of establishing aerial communication with all the countries of the world; the practicability of travel by air through regions where surface transportation does not exist or at best is slow, tedious, and uncertain; to prove the ability of modern aircraft types to operate under all climatic conditions; to stimulate the employment of aircraft to serve the needs of commerce; to impress the people of the world with the excellence of American products in the interests of American industry; and lastly, to assure to the United States the great honor of being the first nation to achieve flight around the world.

Eight men in four planes undertook the hazardous journey, under direction of the War Department. Two of the pilots and their mechanics reached their journey's end in the planes in which they started; another pair flew their machine into the rugged side of an Alaska mountain during a dense fog in which all sense of location was lost, miraculously escaped with their lives, and returned home; the remaining



Photo: Wide World

THE SIX HEROES OF THE 'ROUND-THE-WORLD FLIGHT

From left to right they are Lieutenants Leigh Wade, Eric Nelson, Leslie P. Arnold, Henry H. Ogden, Lowell H. Smith, and John Harding.

pair, after winging their flight two-thirds of the entire distance, lost their plane in the North Atlantic, but finished with their four associates in a new machine hurried to them in Nova Scotia.

The Airplanes and Personnel. The four pilots and their mechanics were listed and assigned in accordance with their rank on the army promotion lists. The planes and personnel were as follows:

Airplane No. 1. The *Seattle*—Major Frederick L. Martin, Pilot and Flight Commander; Staff Sergeant Alva L. Harvey, Mechanic. [This airplane was destroyed on April 30, when it crashed into a mountain in Alaska. The two returned home.]

Airplane No. 2. The *Chicago*—First Lieutenant Lowell H. Smith, Pilot and Flight Adjutant; First Lieutenant Leslie P. Arnold, Mechanic and Alternate Pilot.

Airplane No. 3. The *Boston*—First Lieutenant Leigh Wade, Pilot and Supply Officer; Staff Sergeant Henry H. Ogden, Mechanic. [This plane was destroyed in the North Atlantic. In a new plane, the *Boston II*, Wade and Ogden finished the flight from Nova Scotia.]

Airplane No. 4. The *New Orleans*—First Lieutenant Erik H. Nelson, Pilot and Flight Engineer Officer; Second Lieutenant John Harding, Jr., Mechanic and Assistant Engineer.

The entire distance covered in the historic flight was 27,534 miles, and it was accomplished in 371 flying hours.

The fliers crossed twenty-eight countries, controlled by fifteen nations, and the northern arms of the two greatest oceans. They endured alike the intense cold of the Arctic regions and the scorching heat and sand storms of the wastes of the Mesopotamian desert region. Most dangerous and treacherous of all opposing forces were the banks of fog encountered in the high latitudes; these could not be fought and conquered by any of man's devices, but the aviators flew into and through them with but two disheartening experiences.

The circuit of the earth was dotted with stations where supplies for reconditioning the airplanes had been placed long before the trip was begun. It is worthy of note that each of the two machines which made the entire trip, the *Chicago* and the *New Orleans*, wore out six motors.

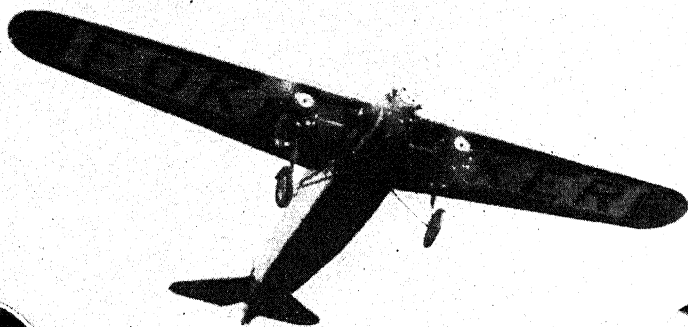
First Hawaiian Flight. On August 31, 1925, two great aeroplanes of the United States navy, the *PN-g No. 1* and the *PN-g No. 2*, each manned by five men, began a non-stop flight from San Francisco to Hawaii. The distance to the first contemplated stop, on Maui Island, easternmost of the Hawaiian group, is 2,000 miles, and to Honolulu, the end of the cruise, about 2,100 miles. The flight was undertaken for the lessons which might be learned in working out naval problems of national defense; added interest attended the event because, if successful, the world's record for non-stop flight over the sea would be achieved.

Misfortune overtook the *PN-g No. 2* almost at the outset of the flight, through structural weakness. The gasoline feed-line to the motors broke, and the plane was picked up by patrols and returned to San Francisco. No untoward fate befell the *PN-g No. 1* until near its journey's end. Heavy head winds slowed up the craft and exhausted its gasoline supply after 1,900 miles had been covered. The plane glided to the surface of a heavy sea. The failure of the gasoline supply made radio broadcasting impossible for lack of power, and patrols could not be advised of the predicament of the crew nor of its location. A receiving instrument



Photo: U & U

JOHN RODGERS



Photos: U & U

THE AIRPLANE FLIGHT OVER THE POLE

The three-engine Fokker airplane which carried Commander Byrd and his pilot Floyd Bennett over the North Pole. Byrd and Bennett are shown in the insets at left and right.

was in service, and the crew heard all messages which filled the air during the frantic search which ensued for nine days. On the ninth day the five men, whose morale had not declined, were picked up 450 miles west of the point where they had dropped from the air, fifteen miles east of the island of Kauai, westernmost of the Hawaiian group. The leader of the daring five was Commander John Rodgers (killed in a flight in 1926).

North Polar Explorations. In May, 1926, within a period of four days, nineteen men looked down upon the location of the North Pole, a spot which in all previous history had been viewed by only four persons. Two ships of the air of different types carried the adventurers to the top of the world from the northern land of Spitsbergen, reaching their objective within a few hours. The result of the successful flights emphasized the sturdiness and dependability of the most modern means of transportation, and drew public attention sharply to the great strides of science within a brief period.

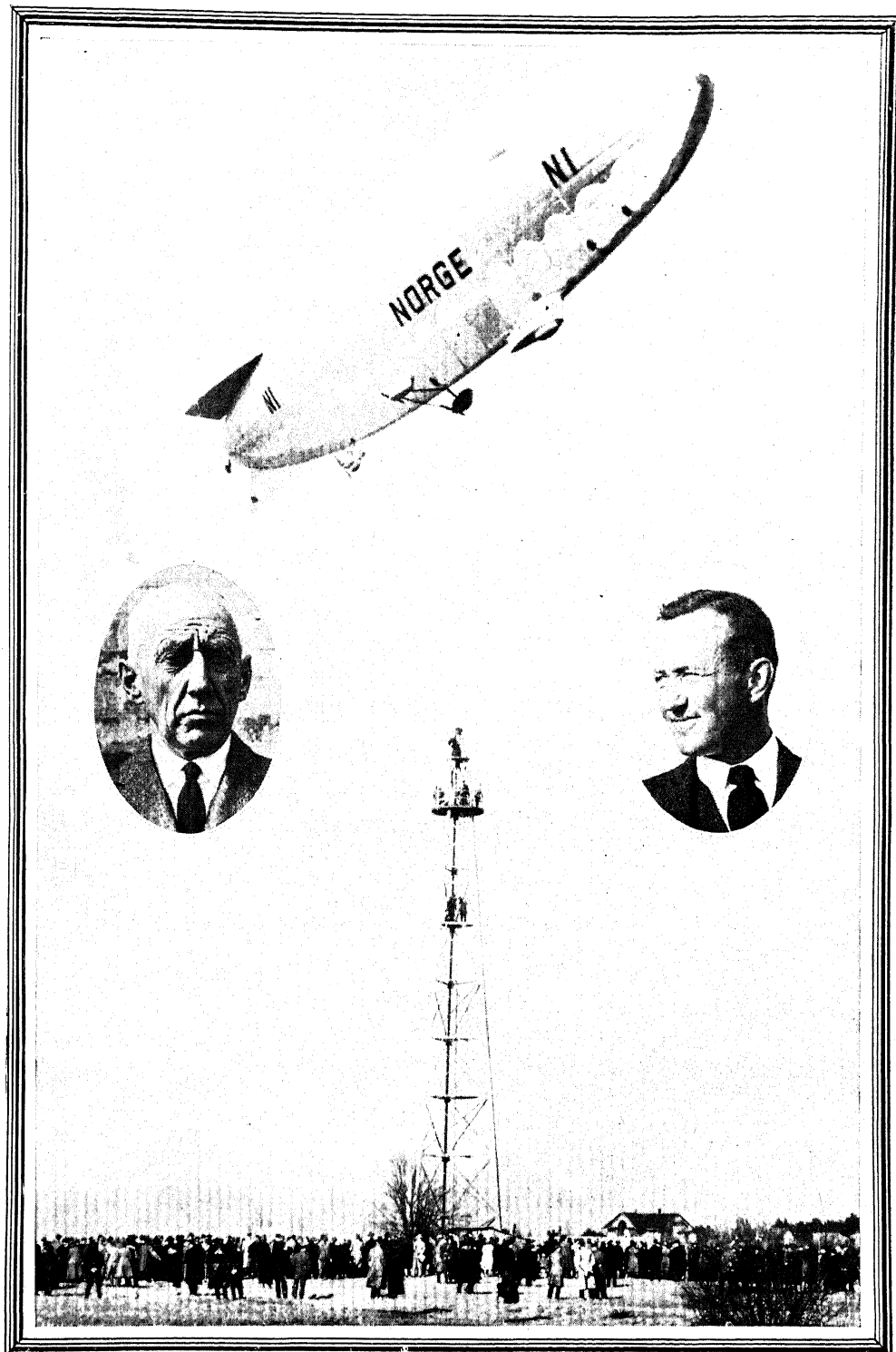
The Byrd Exploit. Lieutenant Commander Richard E. Byrd, of the United States navy, and Floyd Bennett, his pilot (died, 1928), left Spitsbergen in an airplane equipped with three motors, at 1:30 o'clock on the morning of May 9. They flew in a direct line toward the Pole,

circled it, dropped markers as mementos of their visit, and returned to their starting point in early evening of the same day. The distance traveled was approximately 1,500 miles, and the round trip was completed in 15 hours 51 minutes.

To Byrd belongs the credit of having accomplished one of the most daring and hazardous airplane flights in history. With experience in the Arctic covering only a few months in the preceding year, he made the trip in much less time than is required to go by fastest trains from New York to Chicago, and the distance he traveled into the unknown and back was nearly twice as great.

Amundsen and Ellsworth. Roald Amundsen was the first man in history to have reached both the North and the South poles. In 1911 he stood on the "south top" of the world; in association with Lincoln Ellsworth, he failed in 1925 to reach the northernmost limit in an airplane.

In the autumn of 1925 Amundsen and Ellsworth purchased a dirigible balloon in Italy, which they christened the *Norge*, in honor of the former's native land, Norway. With this they announced that an attempt would be made to fly over the Pole in 1926. With an Italian, Colonel Nobile, as pilot, the dirigible was taken by easy stages to Spitsbergen in



Scene: Wide World; insets, U & U

Flight of the Norge. The airship on the way to Spitsbergen for its polar flight; the scene is at Oslo, Norway. Amundsen (left) and Ellsworth (right) are shown in the insets.

early spring, and on May 12, at 1:00 A.M., in full daylight, the flight was begun. Nearly all of three days passed, with the silence unbroken and fear of disaster becoming general, when a dispatch advised the world that the *Norge* had landed at Teller, Alaska, 100 miles northeast of Nome, after a safe journey in a straight line over the Pole from Spitsbergen. When details of the journey were known, it was learned that the Pole was crossed in fifteen hours and that in seventy-one hours the dirigible had flown about 2,000 miles. The *Norge* was dismantled at Teller and shipped to the United States.

Flying in 1927. During more than five months of the year, unparalleled interest was shown in epic flights of men and women who attempted to establish new air records. Hundreds of millions of people experienced almost the entire range of human emotions, from exaltation which reached nearly the height of frenzy over the success of some, to depths of sadness for many who failed in their enterprises and died in the depths of ocean. In no preceding year in the history of aviation had so much daring and courage been displayed, unless one exception be noted—the expedition of the six army fliers who in 1924 braved the dangers of flight around the world.

Victors and Vanquished. A summary of success and failures of trail-blazing pioneers (if a phrase of the plains may be transferred to the air) appears below:

Won

Spirit of St. Louis—Capt. (later Col.) Charles A. Lindbergh—New York to Paris.

Columbia—Clarence Chamberlin, Charles A. Levine—New York to Germany.

Fokker Army Plane—Lieuts. Lester J. Maitland and Albert J. Hegenberger—Oakland to Hawaii.

City of Oakland—Ernest Smith, Emory Bronte—Oakland to Hawaii.

Woolaroc—Arthur Goebel, Lieut. William J. Davis—Oakland to Honolulu.

Aloha—Martin Jensen, Capt. Paul Schluter—Oakland to Honolulu.

Four-Continent Flight—Commander de Pinedo of Italy.

Lost

Goliath—Capt. St. Roman, Commander Mouneyres—St. Louis, Senegal, for Buenos Aires.

White Bird—Capt. Nungesser, Maj. François Coli—Paris, for New York.

Miss Doran—Mildred Doran, J. Auggy Pedlar, Lieut. Vilas R. Knope—Oakland for Honolulu.

Golden Eagle—Jack Frost, Gordon Scott—Oakland for Honolulu.

Dallas Spirit—Capt. William Erwin, A. H. Eichwaldt—Oakland for Honolulu.

Port of Brunswick—Paul Redfern—Brunswick, Ga., for Rio de Janeiro.

St. Raphael—Capt. Leslie Hamilton, Col. F. F. Minchin, Princess Lowenstein-Wertheim—Upavon, England, for Ottawa, Ont.

Sir John Carling—Capt. Terry Tully, Lieut. James Medcalf—London, Ont., for London, England.

Old Glory—Lloyd W. Bertaud, James Dewitt Hill, Philip Payne—Old Orchard, Me., for Rome.

Dawn—Mrs. Florence Grayson and three male companions. Maine for Nova Scotia, then Europe.

Killed Preparing for Ocean Flights

Sikorsky—Jacob Islamoff and Charles Claver, killed at Roosevelt Field, New York, when Capt. René Fonck's plane overturned and caught fire at the start of a projected flight from New York to Paris.

American Legion—Lieut.-Commander Noel Davis, Lieut. Stanley Wooster, United States navy, Langley Field, Virginia, on Paris hop.

Tremaine—Lieut. George W. D. Covell, Lieut. R. S. Waggener, United States navy, entrants in Oakland to Hawaii flight.

Full Cantilever Monoplane—Capt. Arthur V. Rogers, entrant in Oakland to Hawaii flight.

Partially Successful

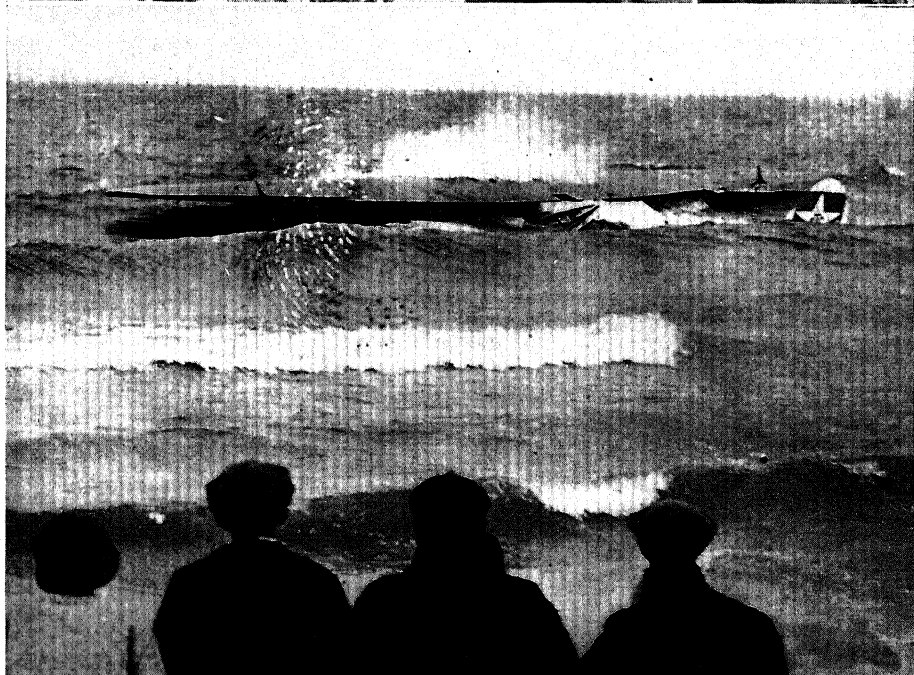
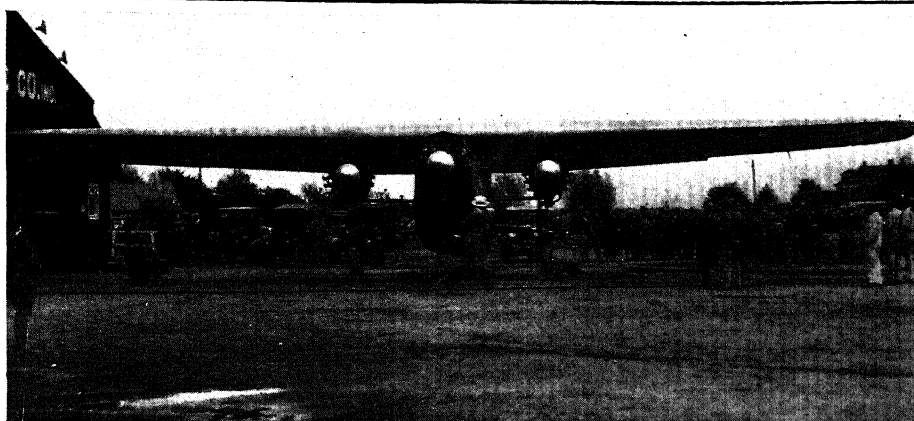
Pride of Detroit—Walter S. Brock and Edward F. Schlee attempted to fly around the world. Cruise abandoned in Japan.

America—Commander Richard E. Byrd, Lieut. George O. Noville, Bert Acosta, Bernt Balchen—New York to France.

American Girl—Ruth Elder and George Halde-man, New York to Paris, rescued at sea, near the Azores.

Chamberlin and Levine. When Captain Lindbergh started from New York to Paris, Clarence Chamberlin and an unidentified passenger were planning the same trip, but were awaiting fairer weather than Lindbergh thought was needed. Over two weeks later Chamberlin and his financial backer, Charles A. Levine, left New York, expecting to land either in Rome or Berlin, thus beating Lindbergh's distance record. While they succeeded in accomplishing the latter, they were forced down by gasoline shortage in a German village about 150 miles west of Berlin. Their non-stop flight covered an estimated 3,905 miles; they were in the air about forty-six hours. Their airplane, the *Columbia*, was almost an exact duplicate of Lindbergh's *Spirit of Saint Louis*.

The Byrd Enterprise. Commander Richard E. Byrd and three companions, manning the two-motored *America*, waiting for fair weather in New York for flight to Paris, saw Lindbergh leave ahead of them. Losing the opportunity to be first to get to Paris in a single flight, they "took off" on the morning of June 29 in the interests of aeronautic science. It proved to be one of the most spectacular flights in history. Buffeted by stronger winds and more severe storms over the ocean than they ever before encountered, and by impenetrable fogs before reaching the European coast, they flew for many hours in an attempt to find Paris. Byrd was certain that at least twice he was over the city, but so thick was the fog that low flight was impossible. Despairing of improved



Photos: P & A; Keystone

The Byrd Trans-Atlantic Flight. Above: The *America* in New York, ready for the journey. Center: Commander Byrd, Bert Acosta, George Noville, and Bernt Balchen. Below: The *America*, after its descent into the sea.

weather conditions, the *America* was headed for the sea, and among the breakers on the northeastern coast of France the four men deliberately crashed into the waves about 200 feet from shore and reached land without more serious mishap than minor bruises. The airplane was destroyed, though the motor and instruments were saved.

Flight to Honolulu. In the spring of 1927, what was known as the Dole Derby, named for James D. Dole, a pineapple grower of Honolulu, who desired to see airplane service established between Hawaii and the American mainland, cost ten lives. Dole offered a prize of \$25,000 to the aviators who should first reach the island, and \$10,000 to the second.

About a dozen airplanes were entered in the competition. The flight started June 28, from Oakland, Calif. During the preliminary tests three died, as related in the table above. Six airplanes started on the 2,400-mile trip, and four reached their destination. These were the *Woolaroc*, *Aloha*, *City of Oakland*, and an army Fokker machine. The first named, piloted by Mr. Arthur Goebel and Lieut. William Davis, won the first prize; they covered the distance in 26 hours 17 minutes from Oakland to Honolulu. Martin Jensen in the *Aloha* was second.

Three of the airplanes which left Oakland never reached the Pacific islands. They went down in the sea; how far they flew and the mishaps which befell them will never be known. Intense interest centered around the *Miss Doran*, for besides two men, J. Auggy Pedlar and Lieutenant Vilas Knope, it carried Miss Mildred Doran, a high-school teacher of Flint, Mich., as a passenger. The *Golden Eagle*, manned by Jack Frost and Gordon Scott, met the fate of the *Miss Doran*.

When, after many hours of anxious waiting, nothing had been heard from the *Miss Doran* and the *Golden Eagle*, the *Dallas Spirit*, manned by Captain William Erwin and Alvin Eichwaldt, started out over the vast Pacific in the hope of locating them; had they been forced down and were yet afloat, rescue might be possible. After the *Dallas Spirit* passed from sight it was not seen again; on its errand of mercy it had met the fate of the others.

The United States navy took up the search, which was continued for more than a week, as many as forty-two vessels of various types being employed. After it was evident the seven people had flown to their death, the effort was abandoned.

Attempt to Fly Around the World. Messrs. Edward F. Schlee and Walter S. Brock late in August left Detroit, Mich., in the airplane *Pride of Detroit*, to attempt a flight around the world entirely in the air, to beat the world record.

Schlee and Brock crossed the Atlantic safely; the route across Europe was easy; they met

with obstructions in Asia in the form of government red-tape, though officials were friendly, and lost several days in complying with requirements. At Tokyo, facing a long and extremely hazardous flight to mid-ocean islands, on a route where they would have to keep their airplane pointed toward a little dot of land in the waste of waters, and slight miscalculation in navigation would leave them hopeless, they abandoned the remainder of their flight and returned home by steamship.

This was one of the most successful long-distance air voyages ever made. The men flew 12,273 miles. Only twice were they forced down in bad weather, both times in Japan.

Nungesser-Coli Disaster. Four airplanes crossed the Atlantic successfully from America or Canada direct to Europe during the summer of 1927. Not one succeeded in the more dangerous flight from Europe to the United States.

Two men attempted the hazardous undertaking one week before Charles Lindbergh left New York for Paris. The leader was Captain Charles Nungesser, a French aviation "ace" in the great war, a master of aeronautics; his companion was Major François Coli, who also won air renown in the war. They undertook the hazard not as aviators, but as adventurers, as challengers of peril. Before them, also, was the lure of a \$25,000 prize, which a few days later Lindbergh won.

They left the coast of France Sunday morning, May 8, with New York City as their goal. They had a gasoline supply for forty hours, and expected to reach their destination in less than thirty-eight hours. The landing gear of their airplane, the *White Bird*, was dropped as soon as the machine was in the air, to save weight, and there were no pontoons to permit landing in water. The men had great faith in an excellent airplane. Somewhere in the Atlantic Ocean they died; no trace of them or their machine was ever found.

Other Westbound Disasters. In mid-August the *Saint Raphael*, a large monoplane, in charge of Captain Leslie Hamilton and Colonel F. F. Minchin, left England, bound for Ottawa, Ontario, in a non-stop flight. Princess Lowenstein-Wertheim, sixty-two years of age, who had flown all over Europe, was accepted as a passenger. The three were not again heard from.

The *Sir John Carling*, manned by Captain Terry Tully and Lieutenant James Medcalf, started from London, Ontario, in an attempt to fly to London, England. They shared the fate that overtook most of the other daring spirits.

A South American Attempt. Mr. Paul Redfern, financed by the city of Brunswick, Ga., in July left that city in the *Port of Brunswick*, with Rio de Janeiro as his destination. About 200 miles off the coast of Northeastern

South America he was in communication with a steamship, after which—silence. If he reached land he may have been lost in the vast jungles of the continent, but it is probable that he dropped into the sea.

Four-Continent Flight. The Marchese de Pinedo, a titled Italian, in a four-months' trip replete with triumphs and severest trials, drove his airship over four continents—parts of Europe, Africa, South America, and North America. His longest single flight was 1,873 miles, from Cape Verde to Fernando de Noronha Island, off the coast of Brazil.

At Roosevelt Dam, in the United States, his airplane was destroyed by fire caused by a boy who threw a lighted match on water overlaid with oil. De Pinedo was obliged to wait for a new machine, sent by Premier Mussolini of Italy.

He visited Buenos Aires; thence flew northward over a vast wilderness and on to Arizona; thence when his new plane reached him from Italy, he described an enormous irregular circle, touching many cities in the United States and Canada, and from Trepassy in Newfoundland began his 1,200-mile flight to the Azores. Off the Azores he was forced down by gasoline shortage, and taken to land by boat. Equipped with new supplies, he flew his plane back to the spot in the ocean where he was obliged to land, and from there his interrupted trip was resumed.

Elder-Haldeman Flight. Miss Ruth Elder (Mrs. Lyle Womack) and George Haldeman waited for weeks in New York for fair weather in which to duplicate the Lindbergh feat. Miss Elder was ambitious to be the first woman to cross the Atlantic in an airplane. On October 11, under conditions quite unfavorable, they headed their machine, the *American Girl*, for Paris. So small a device as a tiny feed-pipe from the gas tank to the motor brought disaster to the enterprise. After passing through terrifying storms and drifting far off their course, the feed-pipe broke. Providentially, as they were forced to the turbulent surface of the ocean, close at hand was a freight steamer, the *Barendrecht*; the aviators were taken aboard, but the *American Girl* was lost.

Made Four Attempts. A courageous woman, Mrs. Florence Grayson, started three times in a two-motored airship, the *Dawn*, from the coast of Maine, with Denmark as her objective. Each time adverse conditions drove her back; on the third flight she had reached a point 600 miles at sea, when she was forced to return. On December 23, accompanied by three men—two pilots and a navigator—she started for the fourth time, and the sea swallowed up the daring adventurers. Searching parties found no trace of them.

Altitude Records. Not in an airplane, but

in a free-flying balloon, an army officer twice reached heights never before attained by man, but he died almost eight miles above the earth, on his second excursion into the perilous cold of the upper regions. However, records of the last flight were recovered; they told their story of the exploit, and he was officially credited with the world's record for altitude.

Captain Hawthorne C. Gray was the aviator. In attempts to outdo other men, some have sailed into unknown seas; others have scaled mountain tops; many have found their chief delight in exploring trackless lands. Gray wished to rise higher into the sky than any other human being had ever ascended.

In May, 1927, he rose 42,470 feet, in comparative comfort, clad, except for the glass in his goggles, in fur and leather. A machine pumped electrically warmed oxygen into his lungs. Not satisfied with that world's record, in November he attempted to set a higher mark. Gray did not live to tell of his experience, for at a height never before reached, he died. It is assumed that in the rarefied atmosphere of the altitude to which he soared, where an artificial supply of oxygen is necessary to sustain life, he accidentally disconnected the feed-line that led from his breathing mask to the oxygen tank.

However, when his balloon reached the earth about one hundred miles from Scott Field, Belleville, Ill., from which the flight started, the recording instruments revealed that he had been 43,000 feet above the ground.

Lindbergh's Atlantic Conquest. Early in May, 1927, two airplanes were ready to take flight on non-stop trips from New York to Paris. One, the *America*, was to be piloted by Commander Byrd, hero of the 1926 flight over the North Pole (see above); the other, the Bellanca plane *Columbia*, was in charge of Clarence Chamberlin. Each group of aviators only awaited favorable weather to begin the hazardous journey.

While they were marking time, information was telegraphed across the continent that an air-mail pilot named Charles Lindbergh intended to fly from San Diego, Calif., to New York to enter his airplane in the contest to achieve first honors in the hazardous flight, and incidentally, perhaps, to win the Raymond Orteig purse of \$25,000, offered for eight years to the navigator first to accomplish a non-stop trip from New York to the capital of France or from the French city to New York. Moreover, the news was telegraphed that Lindbergh intended to fly alone. Little attention was paid to this almost unknown contender except to dub him "the flying fool"; the audacity of the young man who believed that "out of the West," a modern Lochinvar, he could "fly all alone," excited only disbelief everywhere. Besides, San Diego was nearly 3,000 miles distant

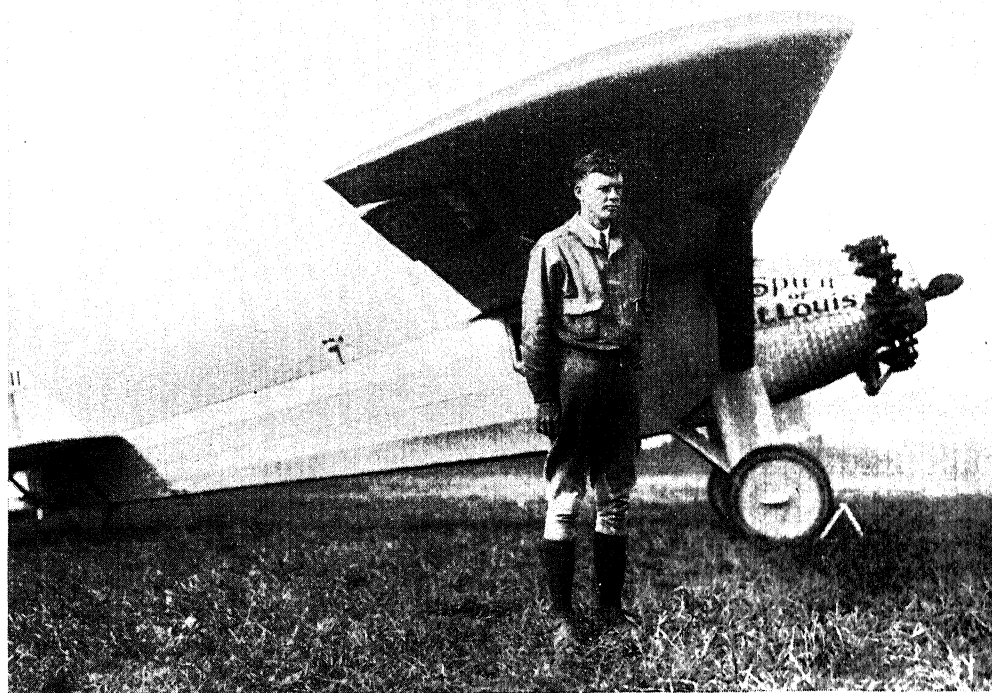


Photo: U & U

"WE"

In addresses in Paris, the "lone eagle of the sea" frequently used the plural "we" in telling the story of his flight. Mystified, the American ambassador asked whom he meant by "we." "My ship and myself," he said, and thus the world realized anew that men may share close companionships with inanimate things.

from the starting point, which he might never reach.

Lindbergh was undisturbed by the sallies whose effect seemed to put his judgment in question; to but few did he disclose the compelling motive for the proposed hazard. He had saved \$2,000 as an air-mail pilot, had enlisted Saint Louis men of wealth to finance the enterprise beyond this limit of the young man's entire capital, had superintended the construction of a small airplane which he believed was the best for its size that could be built, and had secured leave of absence from his air-mail superiors in Saint Louis. Thus for many weeks, without advertisement, he had planned with singleness of purpose for a great adventure. It was not to be attempted for glory, but was to be a bold gesture to advance the cause of aviation. He named his airplane *Spirit of Saint Louis*, not in honor of the city of his adoption, but for King Saint Louis of France, patron saint of the Missouri metropolis. (See illustration, page 6317.)

The fliers in New York who were waiting for favorable weather heard that young Captain Lindbergh had taken flight from San Diego on May 10, and had landed in Saint Louis, almost 1,600 miles eastward, the next day. Stopping only long enough to replenish his gas and oil

supply, he continued on his way to New York, where on May 12 his airplane roared out of the West and dropped on the landing field where stood the competing machines.

Speedily the world was given the news that a 25-year-old boy had just completed a trip across the continent in two flights, with only an army compass to guide him, and that he intended his next stop should be Paris. When told that he had broken the transcontinental record in his cross-continent flight, he gave it as his opinion that the feat was nothing to boast about, and that his mind was set on a new compass and a lot of gas.

From the hour of his arrival on the Atlantic seaboard, he was an amazing figure. He was going alone on a most hazardous journey; he had no navigating instruments, but intended to rely upon an earth-induction compass, flying by dead reckoning; he would not be able to see ahead when seated in his airplane except through a periscope; his ship had only one engine, and it was clear that should anything go wrong for even a minute over the waste of waters, he would be lost.

Off to Paris. Eight days he waited in New York for favorable weather reports. On May 20, although flying conditions might have been more favorable, he put four sandwiches and a

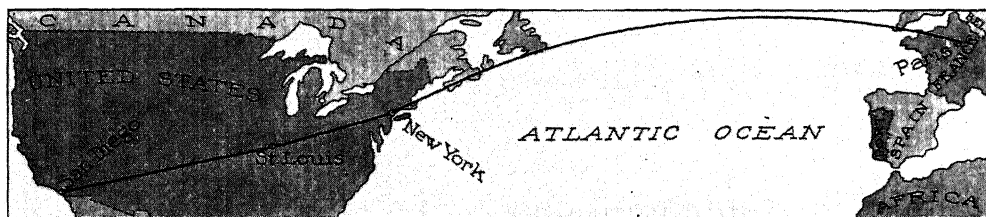
bottle of water in his plane, and at 7:52 A.M. stepped aboard. "I feel as though I had just heard the judge pronounce the death sentence," he said, "but when I land in Paris it will be as though I had a pardon from the governor." So with serious mien he "took off," bidding death an insolent good morning.

The modest, unassuming youngster, anticipating no riotous interest abroad in his exploit, had secured from influential Americans six letters of identification and introduction to as many people in Paris, in the belief that no one could identify him when he landed. Just 33 hours 29 minutes after leaving New York, during which time he was followed in spirit by the best wishes, prayers, and harassing doubts of hundreds of millions in two continents, he landed, 10:21 P.M., Paris time, May 21, on Le Bourget Flying Field, outside of Paris, 3,610

display of the American flag over the building of the French Parliament; he dined with the President of the republic and with the Prime Minister, a former President; he was officially received in the Chamber of Deputies, and was presented with the Cross of the Legion of Honor.

In Belgium and England. After a week spent in Paris, Lindbergh guided the *Spirit of Saint Louis* to Brussels, where he was received by King Albert and Queen Elizabeth; he spent a half hour alone with the king, and received from his hands Belgium's most prized decoration, making him a Knight of the Order of Leopold. In London King George and the royal family paid him honor, and presented him with the Air Force Cross.

Receptions at Home. The fervor of the French, the Belgians, and the English was not



THE ROUTE OF LINDBERGH FROM SAN DIEGO TO PARIS

miles from New York; here a hundred thousand French people, crazed with joy, gave him a tumultuous welcome.

Such is the brief story of an exploit which was most truly a poignantly personal adventure for a large part of the world. At once the aviator was called "lucky Lindbergh," instead of the "flying fool." Men in self-wisdom shook their heads sagely at what they termed the "coincidence" that made his dead reckoning come out right when he shot over Ireland, 2,500 miles from his starting point, less than two miles off his course. As the epic of the flight gradually unfolded, the epithets "flying fool" and "lucky Lindbergh" were found wholly inappropriate to apply to the adequately prepared, self-possessed, clear-thinking young man. In such a flight, something had to be left to chance; he had clear knowledge of the known elements, and an alert brain to cope with the unknown factors.

In Paris. After delivery from the mob which surged upon the Le Bourget field and endangered the safety of himself and the *Spirit of Saint Louis*, he was taken to the American embassy in Paris, where for the period of his stay in the French capital he was the guest of American Ambassador Herrick. Honors unprecedented in history were showered upon him—this statement has been scrupulously weighed. Never before on his own account has a civilian been accorded the honor of the

greater than the enthusiasm which greeted his landing at Washington and his visits to New York and Saint Louis. While the warship which was placed at his disposal was a hundred miles out in the Atlantic off the Virginia capes, on the afternoon of June 10, a great flotilla of flying machines raced through the air to greet the flier.

On the morning of the 11th a great parade down historic Pennsylvania Avenue ended at the base of the Washington Monument, where the President of the United States, in the presence of a vast throng, told the youngster that the nation rejoiced that he was unspoiled.

Upon Lindbergh's breast the President pinned America's offering, the Distinguished Flying Cross. Responding to the laudatory address of President Coolidge, Lindbergh showed clearly his belief that the affection manifested for him abroad was also in great degree a tribute to his country.

On Monday, June 13, New York City tendered a demonstration to Colonel Lindbergh (advanced in rank from captain) almost as spectacular as the celebration of Armistice Day on November 11, 1918. On no other occasion had there ever been such an ovation. Here, during the second day of his triumph in the nation's first city, he was handed the Orteig check for \$25,000, the prize offered for eight years to the person or persons who should be the first to fly in an unbroken trip between

New York and Paris. After five days in New York, tired nearly to the point of exhaustion, but still displaying his charming smile, he pointed the *Spirit of Saint Louis* southwestward, and in five hours was among the home folks in the Missouri metropolis, where again joyous throngs gave him a mighty welcome. This was the final homecoming celebration.

Tour to Promote Aviation. After the official welcome that was accorded Lindbergh in Washington, New York, and Saint Louis, the Colonel was engaged by the trustees of the Guggenheim Fund for Promotion of Aeronautics to visit every state in the Union to bring to the people a realization of the coming day of commercial aviation. It was planned to be an educational journey, to convince America that flying is not to be considered a sport, but a business; he was to demonstrate that flying could be put on a schedule as dependable as train service.

He flew in the *Spirit of Saint Louis* a distance of 22,350 miles, covering the forty-eight states, with the same motor that in May had taken him from San Diego to Saint Louis, to New York, to Paris.

Everywhere he went he was kept busy. The young man made 147 speeches, attended seventy dinners in his honor, paraded 1,285 miles through city streets, and dropped 192 messages of greeting to cities where he was not scheduled to stop. His tour furnished abundant proof that modern airplane equipment may be depended upon to do its regular daily allotment of work and take its place among the definitely timed means of transportation.

Triumphs in Mexico and Central America. On December 13, 1927, Lindbergh left the city of Washington and made a non-stop flight of about 2,030 miles to Mexico City, arriving there twenty-six hours later. This flight of the "ambassador of good will" had remarkable diplomatic results. The few weeks during which the new ambassador, Dwight L. Morrow, had been in Mexico City had witnessed considerable change for the better in the attitude of Mexicans toward the United States. The ambassador conceived the idea that Lindbergh could further cement cordial relations, and an invitation was sent to him to visit Mexico as the guest of the nation. During a visit extending over more than ten days, the young aviator captivated all who saw him. By invitation of Ambassador Morrow, the mother of Lindbergh flew in an airplane from Detroit to the Mexican capital, spent Christmas with her son, and shared in the honors conferred upon the airman.

Two days after Christmas, Lindbergh in the *Spirit of Saint Louis* began a triumphal tour of all the capitals of the Central American republics. His first stop was in Guatemala City; he visited the capitals in order and reached Panama on January 9, 1928. From

AERONAUTICAL TERMS

Technical words dealing with the subject of aviation are now in common use. A list of these words, with definitions, is here given.

Airplane: A mechanically driven aircraft, heavier-than-air, fitted with fixed wings.

Airship: An aerostat (lighter-than-air craft) with a propelling system.

Airship, non-rigid: An airship whose form is maintained by internal pressure in gas bags.

Airship, rigid: Form maintained by a rigid structure.

Airship, semi-rigid: Form maintained by rigid or jointed keel, together with internal pressure.

Free balloon: An aerostat without a propelling system whose ascent and descent may be controlled by use of ballast or with a loss of the contained gas, whose direction is determined by wind.

Glider: Similar to an airplane, but without a power plant.

Ornithopter: Heavier-than-air craft, deriving support and propelling force from flapping wings.

Seaplane: An airplane designed to rise from and alight on the water.

Altimeter: An instrument for measuring elevation of aircraft above a given plane (usually sea level).

Ceiling, absolute: Maximum height at which a given airplane could maintain horizontal flight.

Control stick: The lever by which the longitudinal and lateral (up and down, sidewise) controls of an airplane are operated.

Fuselage: The structure (contains power plant, passengers, cargo, etc.) to which wings and tail unit are attached.

Pay load: That part of the load from which revenue is derived (passengers, freight).

Useful load: Crew and passengers, oil and fuel, ballast other than emergency, ordnance and portable equipment.

Taxi: To run an airplane over the ground, or a seaplane on the surface of the water, under its own power.

Wind tunnel: An elongated chamber (usually a tube) through which a steady air stream may be drawn or forced.

there he flew to Northern South America, then to Cuba, to be present at the international convention of the states of the Pan-American Union (which see).

Some Later "First" Events. Distinction of being the first woman successfully to cross the Atlantic Ocean in an airplane was accorded to Miss Amelia Earhart, a former Chicago school-girl and a licensed pilot, in June, 1928.

The first successful flight from Europe to America was accomplished (April, 1928) by the Germans Von Huenefeld and Koehl and Major Fitzmaurice, head of the Irish Free State aviation service.

The greatest overseas flight yet accomplished is credited to two Australians and two Americans, who in 1928 flew from San Francisco to Brisbane, Australia, more than 7,000 miles, with but two stops—at Hawaii and the Fiji Islands.

In July, 1929, Jackson and O'Brine, Saint Louis (Mo.) aviators, established the world's record for endurance flights. They remained in the air 420 hours 21 minutes.

In November, 1929, Commander Byrd and companions flew over the South Pole. See BYRD, RICHARD E.; POLAR EXPLORATIONS, W. P. McC. [For the service of aircraft in archaeological work, see the article ARCHAEOLOGY.]

Related Subjects. The reader is referred in these volumes to the following articles.

Amundsen, Roald,	Lindbergh, Charles A.
Archaeology (Organized	Maxim, Sir Hiram
Excavation)	Santos-Dumont, Alberto
Balloon	World War
Byrd, Richard E.	Wright, Orville and Wilbur
Curtiss, Glenn H.	Zeppelin, Ferdinand
Langley, Samuel P.	

AIREDALE, air' dale, DOG, one of the largest of the terriers. It has come into prominence but recently, and is rapidly winning its way into popularity as a house dog. Airedales did good work in the Red Cross service during the World War. They are trustworthy and affectionate when their confidence is won, but are often one-man dogs. They represent a cross of the rough-haired English terrier and the otter hound. The hair is stiff and wiry, and in color a mixture of grayish-black and tan. The tail is docked. Airedales weigh from forty to forty-five pounds. See TERRIER. M.J.H.

AIR ENGINE. See COMPRESSED AIR.

AIRPLANE STABILIZER. See GYROSCOPE.

AIR PLANTS, OR EPIPHYTES, ep' i files. Most plants send down roots into the ground to draw up water and mineral nutrients from the soil, but there are some, known as *air plants*, whose most frequent habitat, or home, is the surface of other plants, especially the trunks and branches of trees. They fasten themselves upon other plants, but since they derive no food from their hosts, except salts from the decaying bark, epiphytes are usually harmless. In many cases they form beautiful lacy coverings for the plants upon which they

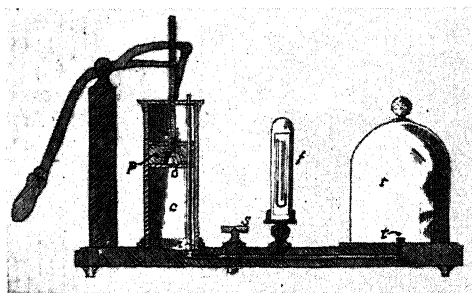
grow. True epiphytes (such as Florida "moss") are to be distinguished from parasitic plants such as mistletoe and dodder (see PARASITE), which feed on their hosts. When epiphytes do injure the supporting plants, it is by shutting off air and smothering them.

Few, if any, flowering air plants grow in the temperate regions, for there is not to be found there the intense heat and moisture which they must have, but in the jungles of South America, Asia, and Africa, gorgeous air-fed orchids flourish. Most air plants with which dwellers in temperate regions are familiar are mosses and lichens. In the Southern states the so-called southern moss, or Spanish moss, a member of the pineapple family, is a well-known air plant. B.M.D.

AIR PUMP, a device for exhausting air or other gases from a closed vessel. The name is also applied to a device for compressing air, though *air compressor* (see COMPRESSED AIR) is a more accurate term. The illustration on page 152 is one of the many forms of the air-exhausting pump used for experimental purposes, and is designed for demonstrating the physical laws governing the pressure of air rather than for practical use in business or industry. The principle governing the operation of all such pumps is the same; a receiver, such as *r* in the illustration, is made air-tight, and the air is pumped out through the tube *t*. A simple arrangement of valves in the pump prevents the air from returning through the tube into the receiver. The ordinary suction pump for raising water from a well is constructed on the same principles as the air pump; before the water reaches the top of the pipe the air has been exhausted by the pump, which then pumps the water. The vacuum cleaner is another practical application of the principles of an air pump.

Some Things to Be Learned from It. The air pump may be used in a variety of simple experiments which illustrate some of the principles of physics. For example, if a lighted candle is placed under the receiver, it will go out the moment the air is exhausted, thus illustrating the well-known fact that oxygen is necessary to combustion, or burning. If the air is gradually exhausted from a receiver under which a glass of water has been placed, bubbles will begin to rise to the surface of the water, thus showing that the water contains air, which tends to expand and rise as the air pressure in the receiver is gradually decreased. Another simple experiment can be made to show that air is necessary to the spread of sound. The ringing of a bell suspended inside the receiver by a thread can be heard when the receiver is filled with air, but when the air is exhausted, no sound is heard. Scientists know, what this simple test proves, that sound is a vibration of the air.

Description of a Simple Air Pump. In order that the operation of an air pump may be understood beyond any possible doubt, the simple form illustrated herewith will be explained in detail. It must not be forgotten that there are several varieties of air pumps, and that the explanation given here would not apply, without slight changes, to any other



CROSS-SECTION OF AIR PUMP

form. In the illustration, r is the receiver, which is made to fit closely upon a flat plate, usually of metal. The bottom edge of the receiver is often greased to make an air-tight connection. From r a tube, indicated by the letter t , leads to a cylinder c , in which there is a piston p . In the base of the cylinder is a valve which allows air to escape from the tube t , and in the piston is another valve which allows air in the cylinder to escape into the space above the piston.

Raising and lowering the pump-handle has an immediate effect. A down-stroke of the piston closes the valve in the base of the cylinder. The expansive force of the air confined below the piston head opens the valve in the piston, and some of the air escapes to the upper side of the piston. The next up-stroke of the piston opens the cylinder valve, and closes the one in the piston. The air which escapes through the piston valve into the space above the piston is forced out through an opening in the top of the cylinder when the piston moves upward. The expansive tendency of the air in the receiver r again fills the lower part of the cylinder, and the entire process is then repeated until a partial vacuum is created. A perfect vacuum cannot be obtained by this apparatus because of mechanical imperfections which are unavoidable. But for ordinary experiments, the vacuum is so nearly perfect as to cause no difficulties. A.L.F.

Application. With each double stroke a certain fraction of the air in the receiver is removed, and this fraction is the ratio of the volume of the cylinder (c) to the combined volumes of c and the receiver (r).

Problem. What is the density of the air left in a liter flask after a complete stroke, if the cylinder of the pump has a volume of 500 cubic centimeters?

SOLUTION. Since 1 liter = 1,000 cubic centimeters, volume of r = 1,000, and ratio of c to $c + r$

$$= \frac{500}{500 + 1,000} = \frac{500}{1,500} = \frac{1}{3}.$$

Therefore, $2/3$ of the air is left at end of stroke 1, for $1/3$ of the air is removed.

Density of air originally = 0.0012 gram per cubic centimeter.

Since $2/3$ of the original quantity of air fills the same space after stroke 1, the density of this amount of air = $2/3$ of 0.0012, or 0.0008, fraction of grams per cubic centimeter.

What would be the density of the air left at the end of two strokes?

Related Subjects. The reader is referred in these volumes to the following articles:

Air	Combustion	Pump	Vacuum
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AIR RIGHTS. Modern cities have become congested because the ground area is limited and is small in proportion to the number of people who wish to use it. This condition has given rise to tall buildings—the skyscrapers so characteristic of present-day architecture. But even these have not furnished room enough, and large buildings are being built in the air above railroad tracks, thus using space that would otherwise be wasted.

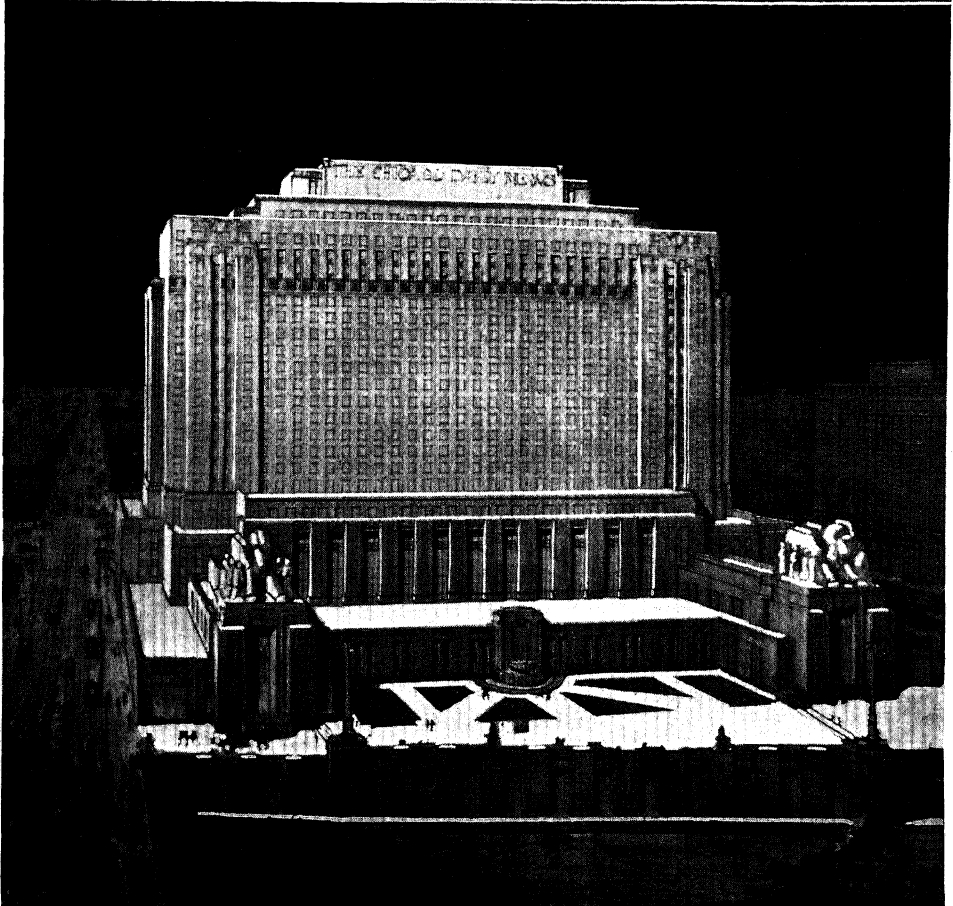
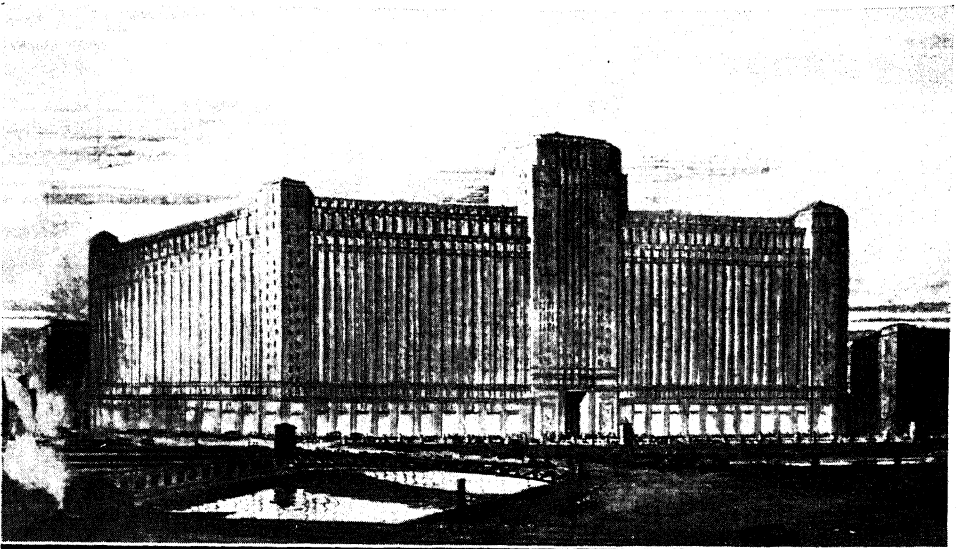
This plan was first developed in New York in connection with an office building constructed above the tracks of the New York Central Railroad. It was found feasible for the railroad to lease the right to such space, so long as the proposed building did not interfere in any way with its regular business. A certain amount of clearance above the tracks must be left (usually twenty feet), and a large chimney running up through the building is provided to carry off the foul air.

The New York Central Building is thirty-five stories high, and is approached by viaducts which carry the streets above the railway tracks.

There are great possibilities in air-rights construction in Chicago. The Illinois Central Railroad occupies several hundred acres along the lake front, between the central business district and the lake, nearly all of which can be thus utilized. The air rights here are estimated to be worth \$100,000,000.

The Chicago Daily News Building is located on the river bank directly east of the Chicago & North Western Station. It is twenty-six stories high and is supported on caissons which rest on bedrock 100 feet below the surface. The air rights of this site have been leased by the *Daily News* for a period of ninety-nine years.

The Merchandise Mart, on the north bank of the river, was erected by Marshall Field & Company at a cost of \$30,000,000. It has a floor space of 4,000,000 square feet, and is used



Photos: U & U

Great Buildings Constructed on Air Rights. Above is the Merchandise Mart, Chicago; it has more floor space than any other building in the world. Below is the home of the *Chicago Daily News*. Both structures stand over railroad rights of way.

to display sample stocks of merchandise from which retail dealers may select their goods.

The leasing of air rights will add immensely to the revenues of the railroads. It has been estimated that those of all the Chicago roads entering the downtown area are worth \$150,000,000, possibly a much larger sum.

Air rights therefore add a third dimension to real estate. Formerly it had length and width only, but now it has height as well. From the examples given, it will be seen that at least in the cities, this third dimension can no longer be ignored.

AIRSHIP. See **AIRCRAFT**.

AIR SPACES are often unfortunately termed air "cells." In plants, such air spaces vary in extent from the minute "intercellular spaces" to chambers or cavities of large size, simple or variously anastomosing (uniting a system or network of branches), and especially characteristic of marsh or immersed plants. Water plants which float upon the surface, such as water lilies, have air spaces in abundance, and are held up by them. The common bladderwort and some seaweeds develop actual air bladders and floats supporting them. B.M.D.

AISNE, *ane*, RIVER, a river in the north-eastern part of France, which henceforth will be one of the historic streams of Europe. Rising in the forests of Argonne, it flows first north and then almost straight west and joins the Oisè River near Compiègne. Its length is about 180 miles, of which nearly 100 miles are navigable. The river Aisne has nearly a parallel course with another historic river, the Marne (which see), and is connected with it and with the Meuse, also, by a canal system.

Battle of the Aisne. During the World War two very important battles were fought on the Aisne. The first, known as the Battle of the Aisne, took place in September, 1914. After the Germans were defeated on the Marne, they retreated across the Aisne and took up positions prepared beforehand. The French and English pursued them, and a series of desperate battles, with great losses on both sides, took place. No decisive victory was won by either side, and the opposing armies maintained their positions and began to dig themselves into a series of fortified trenches. It was after the Battle of the Aisne that trench warfare started.

The second battle on the Aisne took place in January, 1915. It began with a great offensive movement by the French, who succeeded in crossing the river at Soissons. They occupied some ground held by the Germans, but after desperate battles lasting five days, they were compelled to retire across the river to their old positions. See **WORLD WAR**.

AITKEN, JOHN, a Scotch meteorologist. See **DUST, ATMOSPHERIC**.

AIX-LA-CHAPELLE, *eks lah shah pel'*. See **GERMANY (Principal Cities)**.

AIX-LA-CHAPELLE, CONGRESS OF. After the Napoleonic wars, representatives of the great powers of Europe met in conference for the purpose of settling the problems that had

arisen as a result of Napoleon's conquests. The congress met in 1818 at Aix-la-Chapelle, Germany. Besides Czar Alexander I of Russia, Emperor Francis I of Austria, and King Frederick William III of Prussia, the powers were represented by some of Europe's greatest statesmen, including Metternich, Wellington, Hardenberg, and Richelieu. On behalf of France, Richelieu secured the withdrawal of foreign troops from that country. Another major result of the conference was the decision to form the Holy Alliance (which see). This congress was not the body which decided the fate of Napoleon. See **BONAPARTE, NAPOLEON**.

AIX-LA-CHAPELLE, TREATIES OF. Two treaties are known by this name. The first ended the conflict in which France and Spain struggled for possession of a portion of the Spanish Netherlands. The territory was claimed by Louis XIV of France after the death of his father-in-law, Philip IV of Spain, on the ground that Louis' wife, Maria Theresa, was the legal heiress to her father's property. Louis seized several fortresses, but was checked by a Triple Alliance formed by Holland, England, and Sweden. On May 2, 1668, he signed a peace treaty, and hostilities were ended. Franche Comte, which Louis had taken, was returned to Spain, but he retained Charleroi and Lille.

The second treaty was signed in 1748, at the close of the War of the Austrian Succession. The cause of this struggle was the attempt of Prussia, Spain, Bavaria, and France to gain portions of the dominion of Maria Theresa of Austria (see **SUCCESSION WARS**).

AJACCIO, *ah yacht' cho*, capital of Corsica (which see).

AJAX. Two of the legendary Grecian heroes in the Trojan War were named Ajax. The son of Telamon, king of Cyprus, was known as the Greater or the Telamonian Ajax, and the son of Oileus, the king of Locris, was called the Lesser or the Locrian Ajax. The Greater was the commander of twelve ships, and was called by Homer the bravest of the Greeks except Achilles. In the combat between Ulysses and Ajax for the arms of Achilles after the latter's death, the prize was awarded to Ulysses. The disappointment of Ajax drove him mad, and after slaying all of the sheep of the Greeks, thinking they were the enemy, he killed himself.

The boastful and quarrelsome Ajax the Lesser was a rival of Achilles in swiftness of foot. As a punishment for his brutal treatment of Cassandra after the fall of Troy, it is said that his ship was wrecked and he was struck by lightning. See **TROY**, and references there found.

AKELEY, CARL. See **LION**.

A KEMPIS, THOMAS. See **THOMAS À KEMPIS**.

AKKAD, *ak' ad.* See **BABYLONIA**.

AK'RON, OHIO, the world's largest center for the manufacture of rubber products, is the county seat of Summit County and the fifth largest city in the state. It is situated in the northeastern part of Ohio, thirty-five miles southeast of Cleveland, 160 miles southeast of Toledo, and 130 miles northeast of Columbus, the state capital. The picturesque Cuyahoga River flows along the northern boundary, and the Ohio Canal extends through the city. Though abandoned as a commercial waterway, the canal provides a means of transporting water from a chain of lakes in the vicinity, for use by the city industries. Portage Lakes State Park, a neighboring resort of natural beauty, consists of 1,300 acres of connected waters and paved driveways. The city itself has twenty-six parks, with an area of 534 acres, including a municipal golf course. Akron is located at one of the highest points in the state, with an altitude of a thousand feet, in the business section, to twelve hundred feet in the residential districts. The name *Akron* is from the Greek for *a high place*. Population, 1928, 227,000 (city directory figures).

Transportation. Akron is served by the Baltimore & Ohio, the Erie, the Pennsylvania, and the Akron, Canton & Youngstown railroads. Motorbus and trolley interurban lines run to all of the surrounding towns and cities in Northeastern Ohio.

Industries. According to the Federal census of manufactures, Akron is the tenth city in the United States in value of manufactured products, and the second in Ohio. Its twenty great rubber plants consume thirty-five per cent of the world's production of raw material, producing about 30,000 different

articles. More automobile tires are manufactured here than in any other city anywhere. Of great importance, too, is the production of accessory products, such as rubber-factory equipment, refined sulphur, zinc oxide, and braided wire for tire building. Other manufactures of outstanding importance include fishing tackle, breakfast cereals, chemical stone-ware, sewer pipe, porcelain insulators and molds and other clay products, machinery in great variety, iron products, and paint and varnish.

Salt brine is pumped from deep wells, and dried and refined. In the suburb of Barberton is the largest match factory in the world. Printing, publishing, and lithographing, lumber milling, and the manufacture of lighter-than-air craft are other prosperous enterprises. Akron is the center of the dirigible-balloon industry of the United States, and during the World War its factories manufactured more than 1,000 of these airships and balloons.

Institutions. Of particular interest is the Municipal University, a city-owned institution with an enrollment of over 2,000 students in day and night classes. Formerly Buchtel College, it was originally a Universalist institution. Horace Greeley laid its cornerstone in 1872.

History. Akron was marked off as a village in 1825, and incorporated in 1836. It received a city charter in 1865. Its industrial prosperity dates from 1869, when B. F. Goodrich established here its first rubber factories. Akron adopted the commission-manager form of government in 1920, but changed to the mayor-manager and council system in 1924. Two historic points of interest are the homestead of John Brown, abolitionist, and Portage Path, the old trail used by redmen in carrying their canoes from the Cuyahoga to the Tuscarawas River. This trail was part of the western boundary line of the United States in 1785. v.s.s.



ALABAMA. This Southern state of the American Union was once popularly called the **COTTON STATE**. Although Alabama is still among the leading cotton states, it is building for future prosperity upon a broader foundation of diversified agriculture and industry. The state may well look back to the romance and color of the days when "cotton was king," but to-day Alabama not only grows many other crops but also ranks high among the mineral-producing states. Upon the products of its agriculture, forestry, and mining are built great manufacturing enterprises. Another natural resource, the rivers, is utilized for transportation and power.

Derivation of Name. *Alabama* is said by some authorities to be the Creek Indian word for *here we rest*, or *place of rest*, but it is probably another form of *Alibamu*, the name of a tribe of Creek Indians who once inhabited part of the state.

Size and Location. Alabama, in the "cotton belt," lies south of Tennessee. On the west is Mississippi, to which the state once belonged. On the east is Georgia, and on the south it is bordered by Florida and a fifty-mile strip of the Gulf of Mexico. The state has an area of 51,998 square miles, giving it twenty-eighth place among the states.

The People. After the Revolutionary War, when the "Old South" began to expand into

the Indian lands to the south and west, there poured into Alabama mountaineers from the Appalachian highlands; aristocratic Virginians, with their slaves and their horses; French exiles, maintaining their social graces in the wilderness; tobacco farmers; "poor whites," aspiring to grow cotton and become planters, with slaves of their own; but chief among them came the "plain folks," native Americans, sturdy sons and daughters of Presbyterian, Baptist, and Methodist settlers. From 127,900 inhabitants in 1820, Alabama had increased at the last Federal census to 2,348,174, making it the eighteenth state in population. Of this total, one person in sixteen in all the state lived in Birmingham. The capital city of the state is Montgomery.

Alabama has a large number of negro inhabitants; in some counties the negro population is about eighty per cent of the total; the average is about 38 per cent. The further development of the great industrial region surrounding Birmingham is bound to lower this percentage, for the mills and factories are drawing white people from other states. Furthermore, since the World War thousands of negroes have migrated to the industrial sections of the North. Alabama has only 1.2 per cent foreign-born. Italians, Germans, English, and Russians are the most numerous. In the state where De Soto found rich and powerful Indian tribes, to-day only 400 of their race survive. The Baptist Church is the strongest, followed by the Methodist, Roman Catholic, Presbyterian, and Disciples of Christ.

Education. The first constitution of Alabama, adopted in 1819, declared that "schools, and the means of education, shall forever be encouraged." A serious effort was early made to put this declaration into effect. The University of Alabama was organized and ready for students by 1831. Scores of academies, partly supported by public funds, were soon established, and were well patronized. The school system of Mobile County was organized in 1826, and the public-school system of the state in 1854. As in many other states at that time, the schools were not entirely free, all being supported in part by tuition, private gifts, or subscriptions. The War of Secession and the reconstruction evils which followed practically checked all educational development. The University of Alabama, where Frederick A. P. Barnard, the founder of the modern Columbia University, taught for seventeen years, was burned by invading troops; many other school buildings throughout the state were destroyed. With their wealth swept away, poverty-stricken, the people for many years had little money for education, a lack which had for its result the high rate of illiteracy in the reconstruction years.

Since 1900 strenuous efforts have been made to bring the state's educational standards up to modern ideals. In 1919 a commission of five members, appointed by the governor to study the educational system of the state, invited the United States Bureau of Education to accept the task. As a result of its findings, a series of acts, constituting the school code, was passed by the legislature. A state council of education was created to coördinate the work of the University of Alabama, Alabama College, and the Alabama Polytechnic Institute. In 1924 the schools were reorganized, and a new plan of study and textbooks suited to the revised courses were adopted.

For many years the Alabama Education Association has actively presented the educational needs of the state to the people, with the aim of securing increased appropriations from the legislature and higher professional standards for teachers. As a result of much active propaganda, the legislature in 1927 passed a "unified educational bill" which greatly increased the appropriations for public schools, including the higher institutions of learning, and made possible, through an "equalization fund," a minimum free-school term of seven months in every county of the state. It was planned to extend this term to nine months.

While Alabama still ranks the fourth most illiterate state in the country, being surpassed only by Louisiana, South Carolina, and Mississippi, splendid progress is being made toward a higher standard. The percentage of illiteracy was reduced from 22.9 in 1910 to 11.0 in 1927. At the present rate of progress, there will soon be no white illiteracy. A high percentage of illiteracy, however, is still found among the negroes.

There are five state normal schools for whites, located at Florence, Troy, Jacksonville, Daphne, and Livingston. At Montgomery, Tuskegee, and Normal are state normals for negroes. The state also maintains an institute for deaf, dumb, and blind children, at Talladega, Alabama College for Women at Montevallo, and ten agricultural high schools (one in each Congressional district) which are, along with more than 300 other accredited high schools, preparatory schools for the colleges of Alabama. Besides the latter, there are a number of private institutions for higher education, including Athens College, for women, at Athens, and the Woman's College of Alabama, at Montgomery, both founded by the Methodist Episcopal Church; Birmingham-Southern College at Birmingham, supported by the Methodist Episcopal Church, South; Saint Bernard College at Saint Bernard and Spring Hill College at Spring Hill, both Roman Catholic; Judson College, for women, and Marion Institute at Marion, and Howard

College, for men, at East Lake, Baptist; Talladega College, for colored students, at Talladega, and Birmingham Baptist College, for colored students, at Birmingham.

The following institutions are supported wholly or in part by the state:

Alabama Polytechnic Institute, at Auburn, was founded by the state in 1872, as an agricultural and mechanical college. All the agricultural extension work of the state is under the direction of the United States Department of Agriculture and the Institute. It is coeducational.

Tuskegee Normal and Industrial Institute, at Tuskegee, is an industrial school for negroes which has probably done more to lessen the seriousness of the race problem than any other agency in the United States. It was established in 1881 by act of the Alabama legislature, which appropriated \$2,000. The state makes an annual appropriation for the school, but does not control its policies.

In a rented shanty church, school opened July 4, 1881, with thirty pupils and one teacher, Booker T. Washington, a graduate of Hampton Institute. As principal and instructor of the new school, he began then a service extending over a period of thirty-three years. Under his administration Tuskegee became an institution owning 2,300 acres of land, more than a hundred buildings, and various other properties, including livestock and farm implements, the whole valued at over a million and a half dollars; it bids fair soon to reach a value of two million dollars.

The Institute gives students preparatory and high school and college courses, as well as training them to earn their living in some skilled labor after leaving school. Training in religious and social work is furnished in the Phelps Hale Bible Training School. The practical good that is being accomplished by Tuskegee Institute cannot be overestimated. It is aiding students from every state in the Union and from over twenty foreign countries. See NEGRO.

University of Alabama, a non-sectarian, coeducational institution under state control. The seventy-two sections of land which formed the basis of its original endowment were donated by Congress in 1819, the year of Alabama's admission to the Union. In 1884 an additional grant of seventy-two sections was made as compensation for the destruction of the university buildings by Federal troops in 1865.

All the departments of the university—arts and sciences, education, engineering, law, commerce, graduate school, extension division, medicine, and the summer school—are at Tuscaloosa. The institution has for many years been furnishing a large percentage of the public professional men of Alabama. Within recent years it has been taking the lead in the industrial development of one of the potentially richest sections of the country. Its location in the so-called "Birmingham district" gives to it a strategic opportunity to perform this function.

Charitable and Penal Institutions. The State Board of Administration supervises all hospitals, insane asylums, and child-welfare institutions, and the employment of state prisoners. In 1926 a movement was started for the reform of the penal methods. Investigations into the deaths of several convicts at the labor camps resulted in the indictment of two wardens for murder. Reforms had

already been started in the erection of Kilby prison, and purchase of a prison farm. Bills further provided for the establishment of state-owned material plants and for convict road work. Lack of quarters and insufficient state funds made progress in this work very slow.

Institutions include hospitals for the insane at Tuscaloosa and Mount Vernon, a home for feeble-minded at Tuscaloosa, boys' industrial schools at East Lake and Birmingham, a school for negro juvenile delinquents at Mount Meigs, a vocational school for girls, a Confederate Soldiers' Home at Mountain Creek, and prisons at Montgomery and Speigner. The old Wetumka prison was made a women's reformatory on the erection of Kilby prison.

The Land. Alabama has the physical characteristics of the Atlantic coast states. That is, it may be divided into three sections, the coastal plain, the Piedmont region, and the mountains. The Appalachian chain has its southern extremity in the northeastern part of the state, where it dwindles into several parallel ranges of flat-topped hills which nowhere exceed 1,800 feet in height. The most prominent are Raccoon and Lookout mountains, which follow the southwest trend of the Appalachian chain. On the northern end of Lookout Mountain, in Tennessee, one of the great battles of the War of Secession was fought. Southeast of the mountains is the main Appalachian valley, here known as the Coosa, and drained by the Coosa River.

North and west of the Appalachian region is the Cumberland Plateau, whose central feature is the valley of the Tennessee River. The river flows across the state about twenty miles south of the Tennessee boundary. The valley itself includes a broad strip of rolling lowlands, well adapted for farming, but on both sides are rocky table-lands separated by deep river valleys. To the southeast of the Appalachian valley is the Piedmont region, drained chiefly by the Tallapoosa. Long ago the Piedmont section was worn down by erosion and then uplifted by some great convulsion to form a plateau (see **PIEDMONT REGION**).

This varied northern section, including mountains, plateaus, and many valleys, comprises only two-fifths of the state; the remaining three-fifths belong to the coastal plain. In the central part of the state, the plain has an altitude of 600 to 700 feet, but it gradually slopes to the southwest, until in the vicinity of Mobile it is practically at sea level. It is not entirely flat, however, for at irregular intervals are limestone ridges, sometimes ten or twelve miles wide, where the rains and rivers have washed away the surface sands and clays.

Rivers and Forests. Alabama is drained in

the north by the Tennessee River, which flows west and northwest. The Coosa Valley, in the northeast, is drained to the southwest by the Coosa and Tallapoosa rivers, which join to form the Alabama River six miles north of Montgomery, in the central part of the state. Just below Selma, the Cahaba River, coming from the northern coal fields, enters the Alabama.

Here, upon a pleasant point, just below the junction of the Cahaba and Alabama rivers, was once a splendid city, Cahaba, the second capital of Alabama. Where now flourish vine-covered trees and tangled thickets, ladies with powdered hair and gallants in silken coats once hastened to the governor's hall to meet Lafayette. Down the valleys came the floods, rising in sullen menace. The six-year-old capital was hastily moved, first to Tuscaloosa and later to Montgomery. Cahaba lost its brief glory, but in the early "1830's" it regained importance as a river port. The river's threat was forgotten. The War of Secession dealt the next blow to the ill-fated city, and as if to give it no time to recover, stealthily and swiftly the waters rose; when the flood had passed, Cahaba was gone. The river, so legend says, had had its revenge; no more does it rise above the unlucky point, but murmurs along the deserted shores.

From Montgomery, the Alabama follows a winding, southwesterly course to a point nearly fifty miles north of Mobile, where it unites with the Tombigbee to form the Mobile River, which flows into Mobile Bay. The Alabama is navigable from its mouth to Montgomery, a distance of 320 miles, while its tributary, the Coosa, is now navigable to Rome, in Georgia. The Chattahoochee River, flowing south into Florida, forms the southeastern boundary between Alabama and Georgia. The Tombigbee River, which rises in the northeastern corner of Mississippi, winds south and southeast through Alabama and joins the Alabama River. It is 450 miles long and can be navigated for about 400 miles, as far down as Aberdeen, Miss. Its largest tributary is the Black Warrior, which, made navigable by Federal locks and dams, is the great river of the coal fields. The inundation of the lower valleys of the Alabama and Tombigbee rivers, when the coast sank into the Gulf of Mexico, formed the harbor of Mobile. The lower 150 miles of the coastal plain constitutes the chief forest belt, which supplies long-leaf (yellow) pine, the most valuable tree, commercially, in the state. Other woods, such as poplar, oak, cypress, gum, and maple, are found in smaller areas throughout the state. Timber products, lumber, tar, turpentine, and resin, are among the state's foremost industrial products.

Climate. In all parts of the state, but es-

pecially in the mountains and the Piedmont region, the climate is delightful. Extremes of temperature are unusual, as the prevailing winds from the south and southeast are cooled in summer and warmed in winter by their passage over the Gulf of Mexico. The mean temperature for the state is 42° in January and 84° in July. Snow falls occasionally in the north, and perhaps once during the winter on the coastal plain. Rainfall is everywhere abundant, ranging from an average of fifty-two inches a year in the north to sixty-two inches in the south.

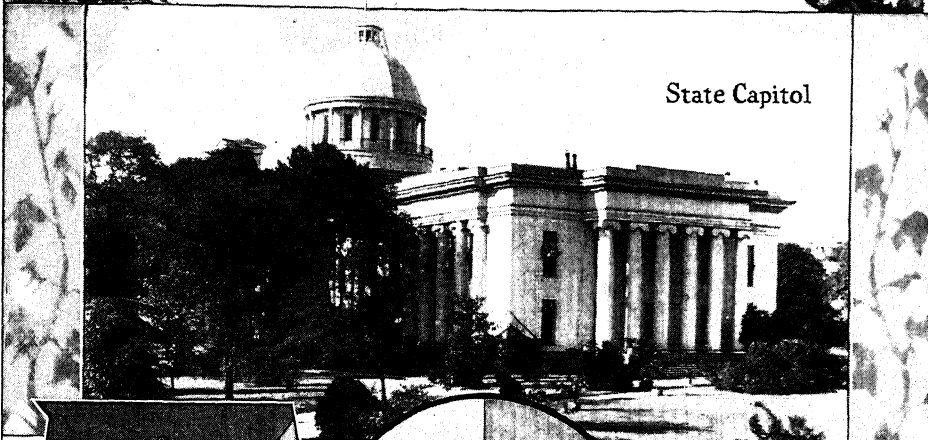
Agriculture. Until the twentieth century, Alabama was primarily an agricultural state. Fifty-one per cent of the total area is now occupied by farms, but less than half (forty-six per cent) of the people make farming their occupation. Through the central part of the state, as also in Georgia and Mississippi, runs a belt of rich black soil containing considerable lime. This is the "cotton belt," with its center at Montgomery. The raising of cotton, however, has been so constant that the land, rich as it is, has become exhausted, and alfalfa and cowpeas have been grown of late years over wide areas, to enrich the soil. Dairying, and hay-raising for commercial purposes, are now the chief occupations in the "black belt." More diversified farming has reduced Alabama's cotton production, though it is still one of the eight leading cotton states. Not long ago cotton and cottonseed were worth nearly twice the total of all other crops, but now they are rivaled in most years in importance by the cereals, of which corn and oats are the foremost. Cereals are raised chiefly in the Piedmont region and in the Tennessee valley, where the soil is a rich red or yellow loam. Vegetables, fruits, and all dairy and poultry products find a market in the industrial cities. Here melons, apples, peaches, strawberries, and other fruits are also grown, and in the south the cultivation of figs, Satsuma oranges, and pecans is increasing. Sweet potatoes, sugar cane, and peanuts are important crops.

In many regions the raising of hogs has taken the place of the small cotton crop, the Agricultural Extension Service having shown the small farmer that the hog is as valuable as and more easily raised than a bale of cotton. Coöperative associations assist greatly in the marketing of livestock and crops. Alabama ranks usually twenty-fourth among the states in agricultural production.

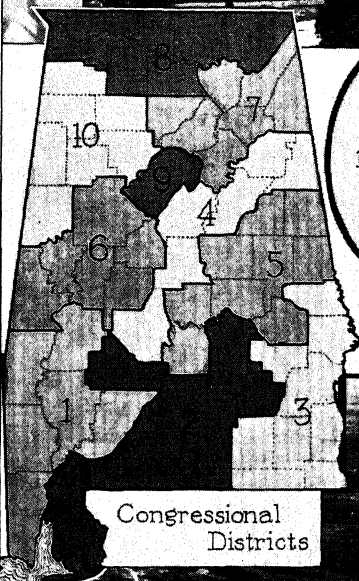
Minerals. The development of mineral resources and industry in about thirty years has been remarkable. Alabama now ranks higher among the states for its minerals than for its agricultural products.

The northeastern part of the state, and the central part as far south as a line from Tuscaloosa to Columbus, Ga., is rich in iron and coal

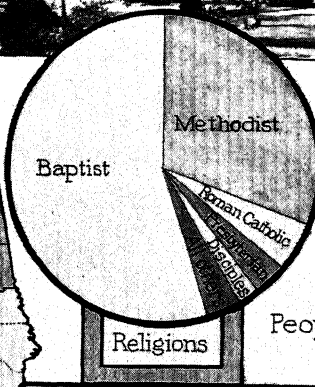
ALABAMA



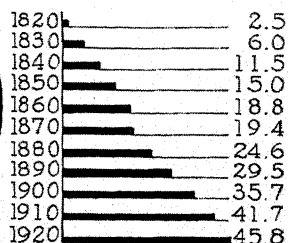
State Capitol



Congressional Districts



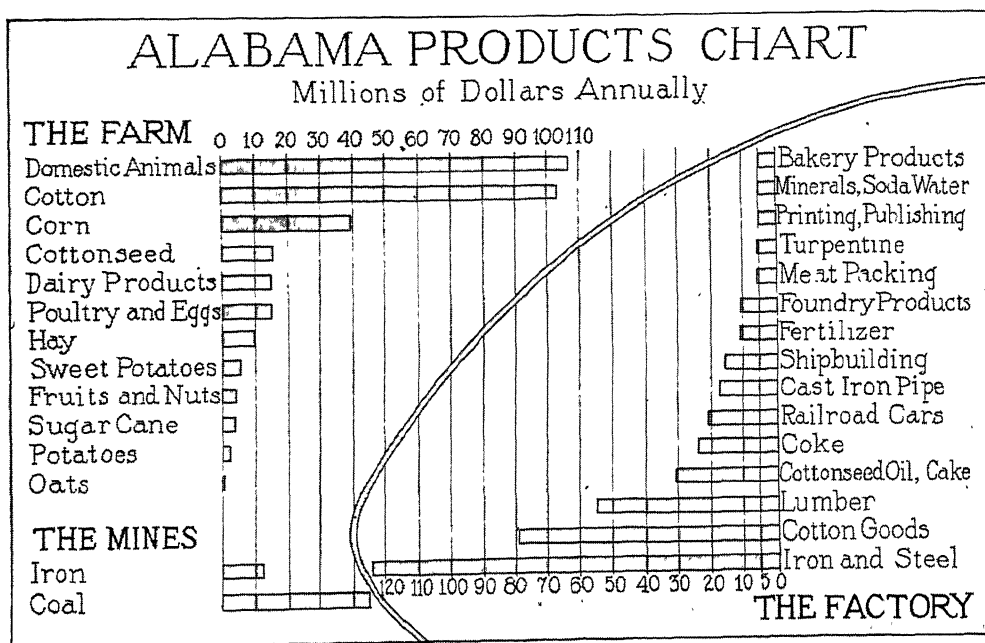
Religions



People per square mile, by decades



Aerial view Wilson Dam, Muscle Shoals



deposits, and also has asbestos, limestone, graphite, bauxite, and petroleum in paying quantities. Though the existence of large mineral deposits has been known for many years, coal having been discovered in 1834, mining has become a great industry only since 1900. In 1880 close to 300,000 tons of bituminous coal were produced; now over 21,000,000 tons are produced yearly, making this state usually seventh in rank in the Union. Much of the coal mined is immediately made into coke, in the production of which Alabama ranks about third among the states. Bibb, Jefferson, and Walker counties produce the majority of the coal, but coal-bearing formations cover about 8,000 square miles in the northern half of the state.

Fortunately for the industrial prosperity of the state, these coal deposits are in close proximity to great beds of iron ore. Alabama ranks third in the production of iron ore, surpassed only by Minnesota and Michigan, and in the output of pig iron usually ranks fifth. Much of the ore is still shipped to other states for smelting, but this proportion is decreasing.

Limestone, dolomite, clay products, and fine marble are abundant. Although Alabama and Texas are the only states producing crystalline graphite, the industry has almost ceased in Alabama because of competition with the cheap foreign supply.

Manufactures. It is because of coal and iron that Alabama, especially the northern section, has become a manufacturing community. Birmingham is the industrial center, known as

the "Pittsburgh of the South." The allied iron and steel industries are the most important group; included in this group are steel works and rolling mills, blast furnaces, and the manufacture of cast-iron pipes. The manufacture of cotton goods is second in value. Cotton, instead of being sent to the North and to England for manufacture, is now used extensively in home factories. Second to cotton, the most important single industry is the making of lumber and timber products. Cottonseed oil and coke follow.

Alabama's chief manufactures are based on raw materials found in the state. Other large industries are railway-car construction, the manufacture of fertilizers, building of ships, and the manufacture of turpentine and resin. Great deposits of limestone, shale and clay, in close conjunction with the rich coal fields, and the slag from the steel mills, have made the cement industry one of growing importance. Alabama usually ranks twenty-fifth among the manufacturing states.

Hydroelectric Development. The three rivers furnishing the largest amounts of utilized and potential water power are the Coosa, where the Mitchell and Jordan dams are located; the Tallapoosa, where three of the 45,000-horse-power units of the Martin Dam began operation in 1927; and the Tennessee River. The projects on the Tallapoosa, when completed, will form one of the largest power units in the South. On the Tennessee, during the World War, the United States built two immense nitrate plants (see MUSCLE SHOALS) and the Wilson Dam. The potential capacity of

the Muscle Shoals hydroelectric plant makes it one of the greatest sources of power in the country.

Alabama is linked with Georgia, North and South Carolina, and Tennessee in a great inter-connecting system of power transmission which utilizes not only the water power of these states, but also the great coal fields of Alabama. The total capacity of this system is estimated at 2,000,000 horse power.

Transportation and Commerce. Nearly all of the rivers are navigable for most of the year, with a mileage greater than that of any other Southern state; the Alabama is navigable for 320 miles, and the Tombigbee for about 400 miles. In earlier days the Alabama was the waterway over which the greater part of the state's commerce was sent down to Mobile for shipment; and in spite of the more recent development of railways, it still carries extensive traffic in cotton, wheat, oats, and other products of the section. In the northern part of the state, the Tennessee River is navigable except near Florence, where a canal has been built around Muscle Shoals. The Tombigbee and the Warrior rivers are navigable by means of canals from the great mineral region to Mobile and the Gulf. Self-propelled government barges travel down the Mississippi River to New Orleans, then to Mobile and up the inland rivers to the northern coal fields.

Mobile is the only seaport of importance. It is the center for the state's export trade in cotton and lumber, but lumber is also sent to Pensacola and cotton to New Orleans. The port is an outlet for neighboring states, as well as for Alabama. The chief imports, besides manganese ore, are tropical fruits and sisal grass, largely from Mexico. The state owns and controls the docks and the port terminal railway which connects the docks with all railway lines entering Mobile.

Alabama was one of the earliest states to introduce railways, having had the first railroad west of the Alleghenies—a forty-mile line connecting the towns at either end of Muscle Shoals. To-day this would scarcely be considered worthy the name of railroad, as its rails were of bar iron, and its trains were drawn by mules.

The railroad mileage is now over 5,200, exclusive of about 400 miles of electric railway. All of the great railway systems of the South tap the mineral regions of the northern part—the Southern, the Mobile & Ohio, the Louisville & Nashville, the 'Frisco lines, the Illinois Central, the Gulf, Mobile & Northern, the Seaboard Air Line, the Atlantic Coast Line, and the Central Railroad of Georgia. Through these systems the state has connection with the great trunk lines of the North and West. The state is now building a comprehensive system of paved highways. During six years

more than \$60,000,000 was spent for good roads.

Government. Alabama has been governed under five constitutions. The one now in force, adopted in 1901, provides for an executive department consisting of a governor, lieutenant-governor, attorney-general, secretary of state, state auditor, state treasurer, commissioner of agriculture and industries, and superintendent of education, elected for four years and ineligible for reelection. The governor is not eligible by appointment or election to any office in the state or to the United States Senate during his term of office, or within one year of its expiration. The governor may veto any bill passed by the legislature, but if he fails to do so within one week after it has been submitted for his approval, it automatically becomes a law.

Members of the legislature, which is composed of two houses, are also elected for four-year terms. The senate may not exceed in number one-third of the members of the house; the latter has 106 members and the former thirty-five. The legislature meets every four years; a proposed amendment to make the sessions biennial was defeated in 1916.

The judicial power is vested in a supreme court, a court of appeals, circuit courts, chancery and probate courts, and various local courts. The senate may sit as a high court of justice for the impeachment of any state officer.

The unit of local government is the county, but cities may be chartered in various classes, according to their population. In the first class, over 100,000, the commission form of government is required; it is optional for cities between 50,000 and 100,000, but required for cities between 25,000 and 50,000. Birmingham is the only city in the first class, Mobile in the second, and Montgomery in the third (see COMMISSION FORM OF GOVERNMENT).

Suffrage in Alabama is restricted by the constitution to those who can read and write any article of the Constitution of the United States, have worked or been regularly engaged in some lawful business or occupation for the greater part of the year preceding the date of registration, or who own and have paid taxes on property valued at \$300 or more. Permitted exceptions are those persons who are physically unable to read, write, or work, and those who have served in the army or navy of the United States or of the Confederate States, in war time, and their lawful descendants. This latter is known as the "Grandfather Clause."

History. The first white men positively known to have visited Alabama were Spaniards led by De Soto, who journeyed along the Alabama River and its tributaries in 1539 (see DE SOTO, FERNANDO). The English also claimed this region. No attempts at settlement were made until 1702, when the French founded

Fort Louis, on the Mobile River. In 1711 the river floods forced the removal of the settlement to a point twenty-seven miles farther south, on the present site of Mobile. Fort Condé, as it was then called, was the nucleus of the first permanent settlement in Alabama.

When the French transferred their colonial empire to England in 1763, Southern Alabama became a part of West Florida, and Northern Alabama was included in the Illinois country, then set aside for the Indians. In 1783, at the close of the Revolutionary War, England ceded the Illinois country to the United States by the Treaty of Paris, at the same time giving West Florida to Spain. The boundaries between these sections were already uncertain, and remained in dispute until 1812, when Congress annexed the Mobile Bay district. In 1813 American soldiers took possession of this territory, and thus for the first time gave the United States actual jurisdiction over the entire area now included in the state. For several years the settlers were in constant danger from the Creek Indians, who went on the warpath to help the British in the War of 1812. At Fort Mims, in 1813, several hundred settlers were massacred. In the next year, however, the power of the Creeks was broken, and most of their land claims were turned over to the United States. In 1817 Alabama, which had formerly been a part of Mississippi, was made Alabama Territory, and on December 14, 1819, was formally admitted to the Union as the twenty-second state. The first capital was located at Saint Stephens. The years of statehood fall naturally into three periods: (1) before the War of Secession; (2) war and reconstruction; (3) a new era of industrial growth.

Before the War. The first half-century of statehood was a prosperous period. Unfortunately, however, this prosperity was founded only on cotton. Cotton prices rose, slaves increased in number, and the planters grew rich almost without effort. But most of the South's wealth was flowing to the North, and also abroad, for luxuries demanded by the planters and not made in the South. About 1850 the South began to recognize that the worn-out soil needed to be conserved, and that cheap negro labor should be used in some way to bring money into the South. Cotton mills seemed the solution, and by 1860 Southern mills were using 200,000 bales of cotton yearly. The mountaineers disliked the plantation and slave system, but were too few and too isolated to affect it.

In general, the people of Alabama favored the extension of slavery into the territories, and in 1848 the ardent supporters of states' rights, led by William L. Yancey, secured the adoption of the "Alabama Platform," in which the Democratic state convention declared that neither the United States government nor any

territory possessed the right to interfere with slavery in a territory. The institution of slavery, accordingly, could be only under state control. The Compromise of 1850 inaugurated a decade of bitter political discussion, which came to an end only with secession and war.

War and Reconstruction. Alabama and South Carolina were most active for secession. On January 11, 1861, an ordinance of secession was adopted by Alabama. The Alabama convention invited the other Southern states to send delegates to Montgomery for the purpose of "securing concerted and harmonious action in whatever measures may be deemed most desirable for the common peace and security." On February 8 a temporary organization was completed by this new convention, a constitution drawn up, a President and Vice-President elected, and the Confederacy came into official existence, with Montgomery as its first capital (see CONFEDERATE STATES OF AMERICA). During the war Alabama suffered little material damage, but practically the entire body of white men was in the army, and the women managed plantations and crops as best they could. In 1863 the Union forces secured the control of a small section in the northern part, and in 1864 Mobile was bombarded. On the whole, however, the state was spared the ruin which war spread over Tennessee and Georgia.

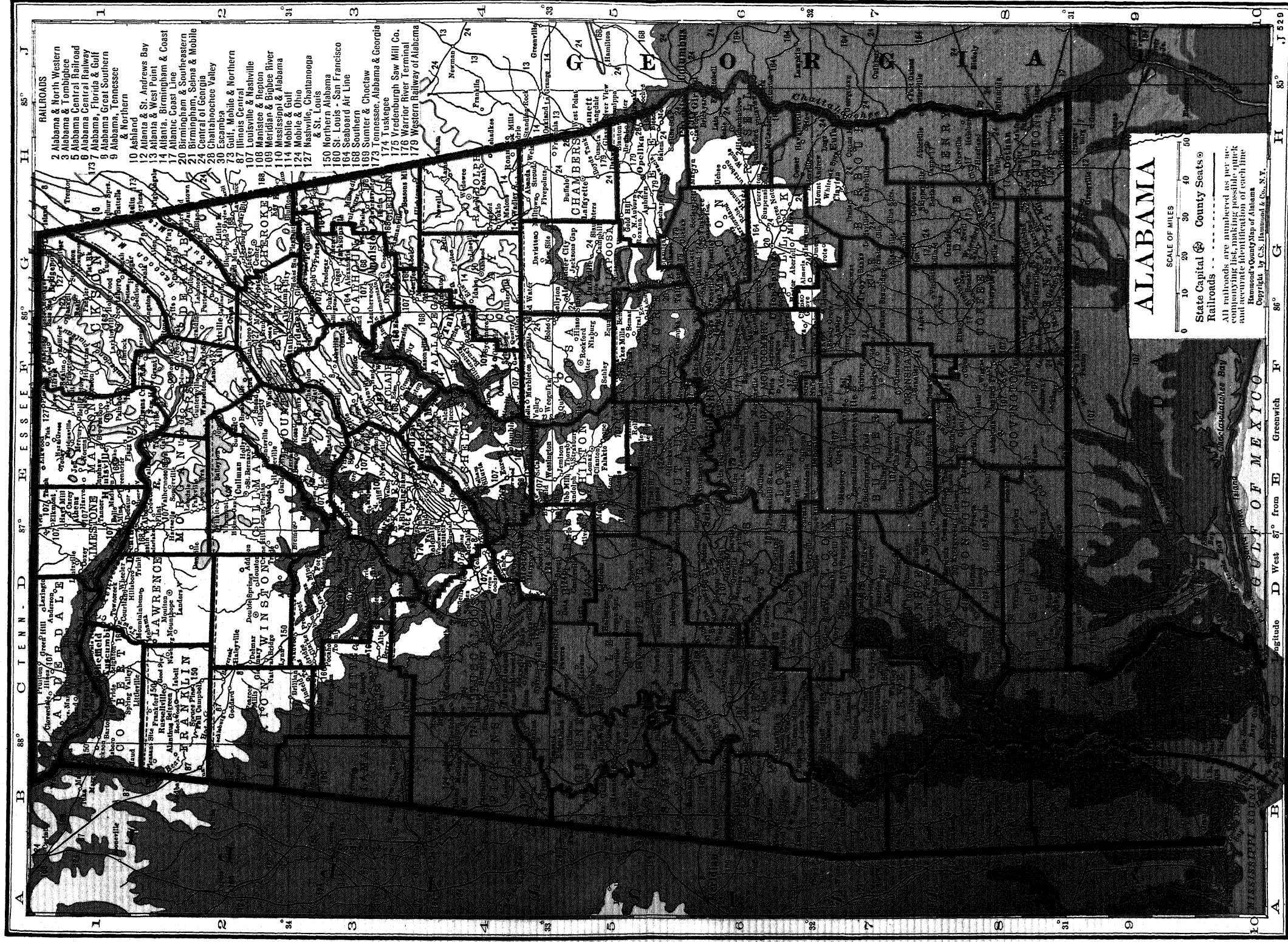
But if Alabama was spared in war, it suffered after peace was declared. Under President Johnson's reconstruction policy, a provisional government was at once organized, but was supplanted in 1867 by a military government under the Congressional plan (see RECONSTRUCTION). With the support of the soldiers, the negroes and carpetbaggers controlled the state government. In seven years the state debt was increased from \$8,000,000 to over \$25,000,000, practically all of the increase being spent wastefully. In 1874 the Conservative Democrats succeeded in electing all the state officials, and they began a thorough reform. The state debt was compromised to \$15,000,000, the carpetbaggers were driven from minor offices, and a new constitution was adopted in 1875 (see CARPETBAGGERS).

A New Era. The end of reconstruction was the beginning of a new prosperity for Alabama. The agricultural districts gradually readjusted themselves to the new conditions and made steady progress. In the north, the founding of Birmingham in 1871 was followed by the development of the surrounding region. Blast furnaces were erected, and Birmingham by 1895 was one of the world's greatest centers of pig-iron manufacture. The first coke furnaces were erected in 1881, and the first steel mills in 1897.

After 1900, Alabama, like many other states, had a long struggle over prohibition, which reached a climax in 1908, when the legislature

ALABAMA

Abanda, (H4)....	100	Boyles, (E3).....	1,364	Cooper, (E5)....	100	Fayette, (C3)....	1,741	Hayana, (C5)....	140
Abbeville, (H7)...	1,267	Bradleyton, (F7)...	150	Coosada Sta. (F6)...	150	Fayetteville, (F4)...	190	Hawridge, (G8)...	120
Abbot, (D7).....	200	Brahead, (D4)....	150	Copeland, (B5)....	100	Fernbank, (B3)....	180	Hayneville, (E6)...	400
Abernant, (D4)....	300	Branley, (F7).....	702	Cordova, (D3)....	1,622	Finchburg, (D7)...	200	Headland, (H8)...	1,252
Acton, (E4).....	1,500	Brent, (D5).....	386	Corona, (D3)....	1,500	Fisk, (E1).....	300	Hefflin, (G3)....	1,026
Ada, (F6).....	100	Brewton, (D8)....	2,682	Cortelyou, (B8)...	200	Fitzpatrick, (G6)...	339	Helena, (E4)....	808
Adamsville, (E3)...	649	Bridgeport, (E1)...	2,018	Cottondale, (D4)...	520	Fivepoints, (H4)...	835	Henryellen, (E5)...	200
Addison, (D2)....	100	Bridgeport, (G1)...	100	Cottonwood, (H8)...	293	Flat Creek, (D3)...	600	Herbert, (E8)....	300
Adger, (D4).....	1,200	Brierfield, (E4)...	2,100	Courtland, (D1)...	367	Flatwood, (D6)...	100	Higdon, (G1)....	100
Akron, (C5).....	675	Brighton, (E4)...	3,665	Covington, (E3)...	500	Flint, (E2).....	177	Highland Home, (F7)100	
Alabama City, (G2) 5,432		Brilliant, (C3)....	700	Cowarts, (H8)....	150	Flomaton, (D9)...	724	Highnote, (G8)...	300
Alameda, (C7)....	200	Brompton, (F3)...	250	Cragford, (G4)...	150	Floral, (F8)....	2,613	Hillman, (E4)....	100
Alamuchee, (B6)...	100	Brooklyn, (E8)...	350	Crawford, (H6)...	200	Florence, (C1)...	12,702	Hillsboro, (D1)...	248
Albany, (E1).....	7,652	Brooks, (F8)....	100	Crews Depot, (B3)...	100	Foley, (C10)....	243	Hixon, (D7)....	150
Alberta, (D6)....	150	Brookside, (E3)...	666	Crichton, (B9)....	100	Forest Home, (E7)...	300	Hobson City, (G3)...	371
Albertville, (F2)...	1,666	Brooksville, (F2)...	100	Cropwell, (F3)...	110	Forest, (C5)....	100	Hodges, (C4)....	279
Aldrich, (E4)....	450	Brookwood, (D4)...	1,550	Crossville, (G2)...	250	Forney, (H2)....	120	Hokesbluff, (G3)...	300
Alexander City, (G5).....	4,190	Browns, (D6)....	200	Cuba, (B6).....	719	Fort Davis, (G6)...	200	Hollins, (F4)....	688
Aliceville, (B4)....	944	Brownsboro, (E1)...	100	Cullman, (E2)....	3,087	Fort Deposit, (E7)...	830	Holly Pond, (E2)...	168
Allenton, (D7)....	200	Brunched, (G7)...	941	Curtis Station, (B6)...	200	Fort Payne, (G2)...	3,229	Hollywood, (G1)...	276
Allgood, (F3)....	200	Buenavista, (D7)...	200	Cusseta, (H5)....	150	Foshee, (D8)....	100	Holt, (C1).....	500
Alpine, (F4).....	100	Burnsville, (E6)...	200	Dadeville, (G5)...	1,146	Fosters, (C4)....	110	Hopewell, (H3)...	200
Alton, (E3).....	200	Butler, (B6)....	250	Daleville, (H8)...	500	Franklin, (D7)...	150	Horton, (F2)....	130
Altoona, (F2)....	1,078	Calebee, (G6)....	250	Danville, (D2)...	220	Fredonia, (H5)...	250	Houston, (D2)....	200
America, (D3)....	100	Caledonia, (D7)...	200	Daphne, (C9)....	700	Fruitland, (B8)...	250	Howels Crossroads (G2).....	100
Andalusia, (E8)...	4,023	Calera, (E4)....	852	Davis Creek, (C3)...	100	Fruithurst, (G3)...	223	Huffman, (E3)....	100
Anderson, (D1)...	230	Calumet, (D3)....	350	Daviston, (G4)...	89	Fulton, (C7)....	709	Hull, (C4).....	300
Anniston, (G3)...	20,531	Calvert, (B8)...	150	Dawson, (G2)....	130	Furman, (E6)....	190	Hunter, (C1)....	100
Arab, (E2).....	264	Camden, (D7)...	700	Dayton, (C6)....	245	Gadsden, (F3)....	19,604	Huntsville, (E1)...	8,018
Arlton, (G7).....	625	Campbell, (C7)...	100	De Armanville, (G3)...	130	Gainesville, (C8)...	100	Huntsboro, (H6)...	868
Arkadelphia, (E3)...	210	Camp Hill, (G5)...	952	Deatsville, (F5)...	194	Gainesville, (B5)...	355	Hymer, (G1)....	100
Arlington, (C6)...	100	Canoe, (D8)....	300	Decatur, (D1)....	4,752	Gallion, (C6)....	200	Inglebrook, (E4)...	1,590
Ashford, (H8)....	754	Capitol Heights, (F6) 812		Deer Creek, (D3)...	270	Gantt, (E8)....	300	Inland, (E3)....	350
Ashland, (G4)....	1,655	Carbon Hill, (D3)...	2,666	Deerpark, (B8)...	120	Gants Quarry, (F4) 413		Inverness, (G6)...	200
Ashville, (F3)....	349	Cardin, (E3)....	463	Delmar, (C2)....	100	Garden City, (E2)...	250	Ironaton, (G4)...	585
Athens, (E1)....	3,323	Carlisle, (F2)....	100	Demopolis, (C6)...	2,779	Garland, (E7)...	250	Irondele, (E3)....	809
Atmore, (C8)....	3,074	Carney, (C9)....	150	Deposit, (F1)....	200	Gasque, (C10)...	130	Isbell, (C2)....	100
Attalla, (F2)....	3,462	Carrollton, (B4)...	564	Detroit, (B2)....	160	Gastonburg, (D6)...	140	Isney, (B7)....	150
Aubrey, (D4)....	300	Carrville, (G5)...	256	Dixons Mills, (C6)...	200	Gate City, (E3)...	700	Jackson, (C7)...	1,331
Auburn, (G5)....	2,143	Castleberry, (D8)...	313	Dolomite, (D4)...	1,000	Gateswood, (C9)...	150	Jacksons Gap, (G5) 260	
Austinville, (E2)...	838	Catherine, (C6)...	200	Dora, (D3).....	1,117	Geiger, (B5)....	116	Jacksonville, (G3)...	2,744
Autaugaville, (E6) 368		Cecil, (F6)....	100	Dothan, (H8)....	14,460	Geneva, (G8)....	1,581	James, (G6)....	400
Avondale, (E3)...	4,500	Cedar Bluff, (G2)...	418	Double Spgs, (D2)...	200	Georgiana, (E7)...	1,550	Jasper, (D3)....	3,246
Baltzell, (C5)....	100	Cedarcove, (F4)...	100	Douglas, (G8)....	100	Geraldine, (G2)...	130	Jefferson, (C6)...	210
Bangor, (E3)....	200	Downs, (C5)....	250	Downs, (G6)....	100	Gilbertown, (B7)...	229	Jemison, (E5)....	419
Banks, (G7)....	299	Center, (G2)....	256	Dozier, (F7)....	237	Girard, (H6)....	4,942	Jenifer, (G3)....	382
Bankston, (C3)...	100	Centerville, (D5)...	793	Drifton, (D3)....	100	Glass, (H5)....	200	Johns, (D4)....	500
Barlow Bend, (C7) 200		Central, (F5)....	100	Duke, (G3)....	150	Glen Carbon, (E4)...	200	Jones, (E5)....	100
Barton, (C1)....	100	Central Mills, (D6) 200		Duncanville, (D4)...	250	Glencoe, (G3)....	500	Jonesboro, (E4)...	1,979
Batesville, (H6)...	143	Chambers, (F6)...	250	Dunham, (E7)....	300	Glenwood, (F7)...	386	Jones Chapel, (D2)...	150
Battle, (G1)....	100	Chapman, (E7)...	1,142	Dunnivant, (E3)...	100	Good Water, (G4)...	920	Jones Mills, (D8)...	576
Bay Minette, (C9) 1,092		Chaton, (B8)....	100	East Birmingham, (E3)...	500	Gordo, (C4)....	642	Joppa, (E2)....	166
Bear Creek, (C2)...	2,292	Chelsea, (E4)....	100	(E3).....	806	Gordon, (H8)....	319	Kaolin, (G1)....	100
Beatrice, (D7)....	293	Cherokee, (C1)...	524	East Brewton, (E8) 500		Goshen, (F7)....	337	Keener, (G2)....	100
Belcher, (H7)....	200	Chesterfield, (G2)...	418	East Tallassee, (G5).....	2,000	Graham, (H4)....	200	Keego, (D8)....	100
Belgreen, (C2)....	300	Childersburg, (F4) 418		(G5).....	2,000	Grand Bay, (B10)...	200	Kellerman, (D4)...	100
Bellamy, (B6)....	500	Chinagrove, (G6)...	150	Echola, (C4)....	200	Granger, (H9)....	200	Kellyton, (G5)...	241
Belle Ellen, (D4)...	400	Choccolocco, (G3) 250		Eden, (F3)....	198	Grant, (F1)....	100	Kennedy, (B3)...	203
Belle Mina, (E1)...	100	Churchula, (B8)...	89	Eden, (F3)....	198	Grassell, (E4)....	600	Keystone, (E4)...	100
Belle Sumter, (D4) 100		Citronelle, (B8)...	932	Edwardsville, (G3)...	334	Gravelly Spgs, (C1) 100		Killen, (C1)....	180
Belville, (D8)....	170	Claiborne, (C7)...	100	Elamville, (G7)...	200	Greenville, (D3)...	428	Kimberly, (D4)...	800
Belis Landing, (D7) 100		Clanton, (E5)....	1,411	Elba, (F8)....	2,575	Greeley, (D4)....	300	Kingston, Autauga Co., (E5)....	100
Bellwood, (G8)...	201	Clayton, (H7)....	989	Eldridge, (C3)...	120	Green Pond, (D4)...	250	Kingston, Jefferson Co., (E3)....	300
Benton, (E6)....	600	Cleveland, (E2)...	150	Elkmont, (E1)...	261	Greensboro, (C5)...	1,809	Kinston, (F8)....	150
Bermuda, (D8)....	300	Clinton, (C5)....	100	Elmore, (F5)....	300	Greenville, (E7)...	3,471	Kirkwood, (D3)...	130
Berry, (C3).....	491	Clio, (G7).....	838	Elvira, (E4)....	250	Grimes, (H8)....	100	Knoxville, (C5)...	100
Bessemer, (D4)...	21,975	Cloverdale, (C2)...	537	Emelle, (B5)....	300	Grove Hill, (C7)...	300	Kymulga, (F4)...	100
Beulah, (H5)....	150	Coalburg, (B3)...	250	Emelle, (B5)....	300	Guerrito, (H6)...	596	Ladiga, (G3)....	150
Bexar, (B2)....	300	Coal City, (F3)...	645	Ensley, (G8)....	8,200	Guin, (C3)....	100	Lafayette, (G5)...	1,911
Billingsley, (E5)...	214	Coal Creek, (D3)...	300	Enterprise, (E8)...	3,013	Gunterville, (F2) 1,909		Lagarde, (G5)...	200
Birmingham (E4) 222,400		Coaldale, (E3)....	500	Eps, (B5)....	722	Gurley, (F1)....	727	Lamar, (H4)....	150
Black, (G8)....	614	Coaling, (D4)....	250	Equality, (F5)...	200	Hackberry, (C2)...	376	Lambert, (B8)...	130
Bladen Springs, (B7) 430		Coalmont, (E4)...	100	Escatawpa, (B8)...	130	Hackneyville, (G4)...	150	Lambert, (C6)...	250
Blocton, (D4)....	2,800	Coal Valley, (D3)...	400	Escatawpa, (B8)...	130	Haleburg, (H8)....	100	Lansenville, (D2)...	200
Blossburg, (E3)...	2,000	Coatopa, (B6)....	100	Estaboga, (F3)...	94	Haleyville, (C2)...	1,404	Landett, (H5)...	4,976
Blount Spgs, (E3)...	300	Cobb, City, (G3)...	100	Eufaula, (H7)....	4,939	Hamburg, (D5)...	150	Langdale, (H5)...	500
Blountville, (E2)...	427	Cochrane, (B4)...	200	Eufaula, (H7)....	4,939	Hamilton, (C2)...	487	Langston, (G1)...	500
Bluemountain, (G3) 605		Coden, (B10)....	250	Eureka, (F3)....	130	Hanceville, (E2)...	441	Lapine, (F7)....	250
Blue Springs, (G7)...	162	Coffee Spgs, (G8)...	312	Eutaw, (C5)....	1,359	Hargrove, (D4)...	350	Larkinsville, (F1)...	222
Bluffton, (G2)....	300	Coffeeville, (B7)...	100	Evergreen, (D8)...	1,813	Hartselle, (E2)...	2,302	Latham, (C8)....	100
Boaz, (F2).....	1,369	Collier, (G2)....	100	Fackler, (G1)....	150	Hatcheechubbee, (H6).....	250	Lebanon, (G2)...	100
Bohice, (B5)....	200	Collinsville, (G2)...	793	Fairfax, (H5)....	500	Leeds, (G3)....	1,600		
Bolling, (E7)....	146	Collinsville, (G2)...	793	Fairview, (E1)...	368				
Bon Air, (F4)....	250	Collinsville, (G2)...	793	Falco, (E8)....	532				
Bon Secour, (C10) 350		Colliene, (H6)....	860	Falkville, (E2)...	362				
Boothton, (E4)....	200	Columbia, (B8)...	860	Farmersville, (E6)...	100				
		Columbiana, (E4)...	1,073	Faunsdale, (C6)...	268				
		Comer, (H6)....	200						



ALABAMA

SCALE OF MILES
0 10 20 30 40 50

State Capital & County Seats
Railroads

All railroads are numbered as per accompanying list, giving possible quick and accurate identification of each line.
Hammond's Quarterly of Alabama
Copyright by C.S. Hammond & Co., N.Y.

- 10 fathoms and over
- 6 - 10 fathoms
- 0 - 5 fathoms
- Sea level to 100 ft.
- 100 - 500 ft.
- 500 - 1000 ft.
- 1000 - 2000 ft.
- 2000 - 3000 ft.

Engraved and printed expressly for THE WORLD BOOK

How to Read a Map: See page xvi, facing text page 1.

ALABAMA Continued

Leesdale, (E2).....	150	Mount Hebron, (B5).....	150	Pierce, (B9).....	100	Saraland, (B9)....	200	Texas, (C3).....	300
Lehigh, (E3).....	300	Mount Hope, (D2) 300	Pikecreek, (E7)...	100	Sawyer, (C5)....	100	Tharin, (F6).....	100	
Leighton, (C1)....	598	Mount Meigs, (F6) 150	Pikeroad, (F6)....	100	Sayre, (E3).....	600	Theodore, (B9)...	300	
Leroy, (B8).....	150	Mount Pleasant, (C8).....	100	Pinckard, (G8)...	969	Sayreton, (E3)...	400	Thomaston, (C6)...	372
Letohatchee, (E6) 300		Mount Sterling, (B6).....	100	Pineapple, (D7)...	464	Shuster, (D7)....	100	Thomasville, (C7), 1,002	
Lexington, (D1)...	160	Mount Vernon, (B8).....	800	Pine Hill, (C7)...	375	Scott, (F6).....	150	Thompson, (G6)...	206
Liberty, (F2).....	200	Mount Willing, (E6).....	300	Pine Level, (F6)...	250	Scottsboro, (G1)...	1,417	Thorsby, (E5).....	513
Lilbit, (B6).....	200	Mulga, (D3).....	400	Piper, (D4).....	500	Section, (G1)....	250	Three Notch, (G6)...	180
Limrock, (F1)....	200	Munford, (G3)...	400	Pittsview, (H6)...	150	Seddon, (F3).....	133	Tilden, (E6).....	230
Lincoln, (F3)....	498	Murrycross, (G2)...	100	Plantersville, (E5)...	150	Sellers, (F6)....	100	Toulminville, (B9)...	150
Linden, (C6).....	700	Muscadine, (H3)...	114	Plateau, (B9)....	200	Sellersville, (G8)...	100	Town Creek, (D1)...	1,405
Lineville, (G4)...	1,507	Myrtle, (F6).....	100	Pleasant Gap, (G2) 100		Searight, (F8)....	71	Townley, (D3)....	1,554
Linwood, (G7)....	100	Nadawah, (D7)...	373	Pleasant Hill, (E6) 500		Searles, (D4)....	700	Traford, (E3)....	250
Lipscomb, (E4)...	1,605	Nanafalia, (C6)...	600	Pleasant Ridge, (B5).....	350	Section, (G1)....	250	Triana, (E1)....	200
Lisman, (B6).....	521	Natural Bridge, (C2).....	335	Pole, (F8).....	643	Seddon, (F3).....	133	Trinity, (D1)....	243
Littleton, (E3)...	100	Naunoo, (C3)....	489	Pollard, (D8)....	631	Sellers, (F6)....	100	Troy, (G7).....	5,696
Livingston, (B5) 968		Nellie, (D7).....	100	Porter, (D3)....	200	Sellersville, (G8)...	100	Trussville, (E3)...	750
Loachapoka, (F5) 480		Nettlesboro, (C7)...	110	Portersville, (G2) 100		Selma, (E6).....	16,987	Tunnel Sprs, (D7)...	150
Lockhart, (F8)...	600	Newala, (E4)....	150	Powers, (C5)....	250	Selma, (E3).....	300	Turnbull, (D7)...	150
Longview, (E4)...	250	Newbern, (C5)....	438	Powderly, (E4)...	300	Seman, (F5).....	100	Turner, (F3)....	100
Louisville, (G7)...	504	New Brockton, (C8).....	467	Prairie, (D6)....	180	Seminole, (C10) 200		Tuscaloosa, (C4)...	13,083
Lowick, (E3).....	100	Newburg, (C2)...	250	Prairieville, (C5) 100		Shady Grove, (F7) 500		Tuscumbia, (C1)...	3,855
Lower Peachtree, (C7).....	700	New Castle, (E3)...	100	Prentice, (C6)...	2,316	Shelby, (E4)....	750	Tuskegee, (G6)...	2,475
Lowndesboro, (E6) 500		New Hope, (F1)...	315	Prentiss, (B9)...	200	Shiloh, (C6)....	100	Tuskegee Institute, (G6).....	100
Luverne, (F7)....	1,464	New Market, (F1) 300		Prichard, (C6)...	195	Shiloh, (C6)....	100	Union, (C5).....	100
McCullough, (C8) 300		New Newsite, (G4)...	300	Prichard, (B2)...	195	Shiloh, (C6)....	100	Union Grove, (F2) 170	
McCullum, (D3)...	200	Newton, (G8)....	680	Pushmataha, (B6) 100		Silberhill, (C5)...	310	Union Spgs, (G6)...	4,125
McDowell, (C5)...	200	Newville, (H8)....	547	Pyrton, (G4)....	200	Sipse, (D3).....	230	Uniontown, (C6)...	1,359
McFall, (F3).....	1,000	Nokomis, (C8)...	200	Quinton, (D3)...	100	Sistrunk, (F5)...	190	University, (C4)...	150
McKenzie, (E7)...	293	Normal, (E1)....	100	Ragland, (F3)...	613	Sistrunk, (F5)...	190	Uriah, (C8).....	300
McKinley, (C6)...	200	North, (F2).....	100	Ramer, (F6).....	350	Sistrunk, (F5)...	190	Valley Head, (G1)...	300
McLendon, (H6)...	150	North Birmingham, (E3).....	5,500	Randolph, (E5)...	350	Sistrunk, (F5)...	190	Verbera, (F5)....	400
McNiel, (D8)....	150	Northport, (C4)...	1,606	Red Bay, (B2)....	753	Sistrunk, (F5)...	190	Vernon, (B3)....	440
McShan, (B4)....	150	Notasulga, (G5)...	619	Red Level, (E8)...	385	Slocomb, (G8)...	581	Victoria, (G7)...	100
McWilliams, (E7)...	156	Nottingham, (F4) 100		Red Star, (D3)...	150	Slocomb, (G8)...	581	Vida, (E5).....	150
Maben, (D3).....	200	Oakachie, (B6)...	100	Reform, (C4)....	1,069	Smith Hill, (D4)...	431	Vienna, (B4)....	79
Madison, (E1)....	435	Oak Grove, (B9)...	100	Rehoboth, (D6)...	1,069	Snowdown, (F6)...	200	Vina, (B2).....	339
Madrid, (H8)....	250	Oakhill, (D7)....	300	Renfro, (F4)....	98	Snow Hill, (E7)...	500	Vincent, (F4)....	1,034
Magazine, (B9)...	250	Oak Hills, (D3)...	1,083	Repton, (D8)...	422	Society Hill, (G6) 100		Vinegar Bend, (A8) 540	
Magnolia, (C6)...	500	Octagon, (C6)...	100	Republic, (E3)...	350	Somerville, (E2)...	300	Vinemont, (E2)...	100
Magnolia Springs, (C10).....	200	Odenville, (F3)...	375	Richmond, (D6) 200		South, (E8)....	100	Vredenburgh, (D7) 874	
Malone, (G4)....	150	Old Spr. Hill, (C6) 100		Rickey, (D4)....	300	Somerville, (E2)...	300	Wadley, (G4)....	508
Malvern, (G8)...	221	Olney, (B4).....	150	Riderville, (E5)...	100	South, (E8)....	100	Wadsworth, (F5)...	300
Manchester, (D3) 500		Oneonta, (E3)...	876	Riderwood, (B6)...	591	Spaigner, (F5)...	100	Walker Spgs, (C7) 100	
Manistee, (D8)...	150	Opelika, (H5)....	4,960	River Falls, (E8)...	1,107	Spring Garden, (G3).....	300	Wallace, (D8)...	200
Maplesville, (E5) 376		Opp, (F8).....	2,866	River Ridge, (D7) 300		Springhill, (B9)...	300	Walnut Grove, (F2) 167	
Marble, (D8)....	100	Orion, (F7)....	150	Riverside, (F3)...	200	Springville, (C1) 100		Ward, (B6).....	100
Marbury, (F5)....	450	Orrville, (D6)...	341	Riverton, (B1)...	200	Springville, (E3) 450		Warrenton, (F2)...	130
Margaret, (F3)...	400	Oswassa, (E8)...	100	Riverview, (H5)...	200	Spruce Pine, (C2) 210		Warrior, (E3)....	568
Marion, (D5)....	2,035	Owens Crossroads, (F1).....	100	Roanoke, (H4)...	3,841	Stofford, (B4)...	450	Warriorstand, (G6) 400	
Marion Jr., (D6) 200		Oxford, (G3)....	1,108	Robertsdale, (C9) 300		Standing Rock, (H4).....	698	Waterloo, (B1)...	415
Martling, (F2)....	160	Ozark, (G8)....	2,518	Robinsons Springs (F6).....	110	Stanton, (E5)...	400	Water Valley, (B7) 100	
Martel, (D4)....	400	Paint Rock, (F1)...	332	Robjohn, (B6)...	150	Steele, (F3)....	100	Watson, (E3)....	1,000
Marvyn, (H6)....	300	Palos, (D3)....	200	Rockford, (F5)...	274	Stevenson, (G1) 100		Waverly, (G5)...	208
Mathews, (F6)...	200	Parola, (B5)....	190	Rock Mills, (H4) 267		Stewart, (C5)...	300	Webb, (H8)....	200
Mathews, (F6)...	200	Pansey, (H8)....	166	Rock Run, (H4)...	500	Stockdale, (F4)...	100	Weaver, (G3)....	210
Maylene, (E4)...	350	Panstone, (H5)...	150	Rockwood, (C2) 240		Stockton, (C9)...	600	Webb, (H8)....	415
Maysville, (F1) 220		Parrish, (D3)...	300	Rogersville, (D1) 397		Stout's Mt., (E2) 500		Wedgworth, (C5) 100	
Mehama, (D1)....	300	Patsburg, (F7)...	150	Rosemary, (C5)...	100	Strata, (F6)....	442	Wedowee, (H4)...	510
Meltonville, (F2) 100		Patton, (D3)....	300	Round Mountain, (G2).....	210	Stroud, (H4)....	442	Wellington, (G3)...	150
Meridianville, (E1) 220		Pearces Mills, (C2).....	2,606	Roy, (D8).....	442	Strudwick, (C5)...	150	West Blocton, (D4).....	1,023
Midland City, (H8) 665		Peekshill, (F3)...	100	Russell, (B8)...	200	Suggsville, (C7)...	340	West Butler, (B6) 250	
Midway, (G6)....	524	Pelham, (E4)....	100	Russellville, (C2) 2,606		Sulligent, (B3)...	1,071	Wetumpka, (F5)...	1,520
Mignon, (F4)....	2,028	Pell City, (F3)...	825	Rutan, (B8)....	150	Sulphur Spgs, (G1) 100		Whateley, (C7)...	187
Millport, (B3)...	604	Pennington, (B6) 100		Rutledge, (F7)...	155	Summerdale, (C10) 100		Whistler, (B9)...	2,000
Milltown, (G4)...	100	Pera, (F8).....	150	Saco, (G7).....	200	Summerfield, (D6) 450		White Oak Springs, (H7).....	635
Minter, (E6)....	300	Perduehill, (D7) 350		Safford, (D6)...	150	Summit, (E2)...	150	White Plains, (G3) 250	
Mitchell Sta., (G6) 350		Perote, (G7)....	134	Saginaw, (E4)...	200	Summit, (E2)...	150	Whitfield, (B6)...	200
Mobile, (C9)....	69,600	Perryville, (D5)...	100	Saint Clair, (E6) 100		Sunny South, (C7) 150		Whitney, (F3)...	100
Monroeville, (D7) 1,017		Petry, (F7)....	165	Saint Clair Springs, (F3).....	150	Superior, (E4)...	130	Wilmer, (B9)....	500
Montcalm, (C3)...	150	Phenix City, (H6) 5,432		Saint Elmo, (B10) 100		Suspension, (G6) 100		Wilsonville, (F4)...	815
Monterey, (E7)...	300	Phil Campbell, (C2) 418		Saint Florian, (C1) 450		Sweetwater, (C6) 100		Wilsonville, (F4)...	815
Montevallo, (E4)...	850	Pickensville, (B4) 158		Saint Stephens, (B7).....	180	Sycamore, (F4)...	500	Winfield, (C3)...	753
MONTGOMERY, (F6).....	63,100	Piedmont, (G3)...	2,645	Salem, (H5)....	310	Sykes Mills, (F5)...	100	Womack Hill, (B7) 100	
Moores Bridge, (C4) 300				Samson, (F8)...	1,646	Talladega, (F4)...	6,546	Woodstock, (D4)...	500
Mooresville, (E1) 144				Sanders, (H8)...	100	Talladega Springs, (F4).....	257	Woodville, (F1)...	191
Moro, (E6).....	100			Sandusky, (E3)...	491	Tallassee, (G6)...	2,034	Woodward, (F4)...	1,000
Morris, (E3)....	299			Sandy, (D5)....	400	Tarrant City, (E3) 734		Wyeth City, (F2) 400	
Motley, (G4)....	100			Sanford, (F8)...	742	Yarbo, (B7)....	200	Yellow Pine, (B8) 500	
Moulton, (D2)...	519					Yolande, (D4)....	1,000	Yorke, (B6).....	1,651
Moundville, (C5) 328						Yucca, (G1)....	190		
Mountain Creek, (F5).....	300								
Mount Andrew, (H7).....	300								

QUESTIONS ON ALABAMA

(An Outline suitable for Alabama will be found with the article "State.")

Trace the history of Cahaba.

Give two theories as to the origin of the name of the state.

What is the population make-up of the state? Can you see any effect that further industrial development might have on the foreign population?

What and where is the Wilson Dam?

For how many miles above Mobile is the Alabama River navigable?

Do the combined cotton and cottonseed products exceed in value other agricultural resources?

What is Alabama's place among the states as to illiteracy?

What is meant by the "Grandfather's Clause"?

How does Alabama compare in size with Mississippi? With Georgia?

How does it rank among the states as regards population? As regards area?

What has been Alabama's chief industrial development since the War of Secession?

What is meant by the "black belt"?

How does the density of population compare with that of Illinois? Of Florida?

What is being done to raise the educational standards of the state?

What is the capital of Alabama? Has it always been the capital?

Why is Birmingham called the "Pittsburgh of the South"? Contrast the two cities with respect to population.

Where was the first railroad west of the Alleghenies?

For what is Fort Mims noted?

Describe the great negro school of Alabama.

How may the state be divided according to surface features?

What part did Alabama play in the early history of the Confederacy?

When did the first white man enter the territory?

How does Alabama rank among the states of the Union with regard to its coal production?

When did the territory now included in Alabama become a part of the United States possessions?

What special reason did Alabama have for being strongly in favor of slavery?

What is there especially fortunate in the arrangement of Alabama's productive mineral beds?

What determined the location of Birmingham?

Of what importance are the rivers in regard to water power and commerce? Describe developments in each.

What is being done to modernize penal methods?

Is the population largely urban or rural?

Trace the course of the prohibition movement in Alabama.

When was the first settlement made on the site of Mobile?

To how many nations has the Alabama territory belonged?

What effect has too much cotton-raising had on the soil? Why? What is being done about it?

What is the seaport of the state? How was it formed in geology? What are its imports and exports?

Can you discover a major fault in Alabama's legislature? Give reasons for your view of the matter.

What was the *Alabama*?

What were the "Alabama Claims"?

Which rivers serve the coal fields of the state? Which one serves the cotton region?

Does Alabama rank higher as a manufacturing or as an agricultural state?

What is the importance of Muscle Shoals?

passed a state-wide prohibition act, called "the most drastic prohibition act ever passed by any state." In 1909 a prohibition amendment to the constitution was defeated by a large majority. This reaction was followed in 1911 by the adoption of a local option system, in which the county was the unit. Finally the legislature adopted state-wide prohibition, which went into effect on June 30, 1915, preceding the national amendment. J.J.D.

Related Subjects. The above article confines itself to general description. A more detailed knowledge of the geography of Alabama may be gained from a study of the following articles:

CITIES AND TOWNS

In addition to the cities named below, which appear in their alphabetical order in these volumes, others are referred to on the back of state map.

Birmingham Mobile Montgomery

COAST WATERS

Mexico, Gulf of Mobile Bay

HISTORY

Alabama, The	Local Option
Carpetbaggers	Prohibition
De Soto, Fernando	Reconstruction
Fort Mims, Massacre of	

LEADING PRODUCTS

Coal	Iron
Coke	Lumber
Corn	Sugar Cane
Cotton	

RIVERS

Alabama	Coosa
Chattahoochee	Mobile
Tennessee	

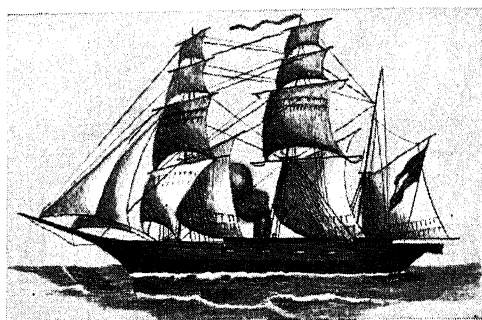
SURFACE FEATURES

Appalachian Mountains	Cumberland Mountains
Coastal Plain	Piedmont Region

ALABAMA, THE, the most destructive and consequently the most famous of the Confederate privateers which preyed on Federal merchant vessels during the War of Secession. The *Alabama* was built at Birkenhead, England, in 1862, under circumstances so suspicious that the United States minister, Charles Francis Adams, called the British government's attention to the vessel. Contrary to international law and Queen Victoria's proclamation of neutrality, it was allowed to sail, and made its way to the Azores Islands, where it took on guns and stores from another vessel. Captain Raphael Semmes, who named the vessel, took command on August 24, 1862, and for two years made his name and the name of his ship the terror of Federal merchantmen. In two years the *Alabama* captured sixty-five ships, and destroyed property valued at \$4,000,000. For two years Federal cruisers sought for the *Alabama* on all seas, and finally, on June 11, 1864, it was compelled to take refuge in the harbor of Cherbourg, France. The United States *Kearsarge*, Captain John A. Winslow commanding, entered the harbor a few days later, and gave battle on June 19, 1864. Within

an hour the *Alabama* was sunk, in sight of hundreds of spectators who crowded the shores.

Alabama Claims. During the War of Secession and for several years after its close, the chief diplomatic issue confronting the United States was whether or not Great Britain was responsible for the damage done by the *Alabama* and other cruisers fitted out in British ports. After considerable useless negotiation, the issue was submitted to arbitration



THE FAMOUS "ALABAMA"

(see WASHINGTON, TREATY OF). The arbitrators were five in number, one appointed by the king of Italy, one by the President of Switzerland, one by the emperor of Brazil, one by Great Britain, and one by the United States. Charles Francis Adams was the American representative, and Sir Alexander Cockburn, Lord Chief Justice of England, represented Great Britain. The arbitrators met at Geneva, Switzerland, on December 15, 1871, and on September 14, 1872, signed the final award. The decision held Great Britain responsible for losses caused by the *Alabama* and several other ships, and ordered the payment of \$15,500,000 by Great Britain to the United States in settlement of all claims. This money was afterward distributed to the individuals who had suffered losses. See, also, CANADA (History: National Problems).

ALABAMA, UNIVERSITY OF. See ALABAMA, (Education).

ALABAMA COLLEGE FOR WOMEN. See ALABAMA (Education).

ALABAMA PLATFORM. See ALABAMA (History).

ALABAMA POLYTECHNIC INSTITUTE. See ALABAMA (Education).

ALABAMA RIVER, the largest stream which flows through the fertile farm lands and the richest forests of the state of Alabama. It is formed by the junction of the Coosa and the Tallapoosa rivers, six miles north of Montgomery, in the central part of the state. From Montgomery it follows a winding southwesterly course to a point about fifty miles north of Mobile, where it unites with the Tombigbee to form the Mobile River. It is navigable from its mouth to Montgomery, and in earlier days was the chief commerce carrier of the state. In spite of the development of railways, it still carries extensive traffic in products of the section.

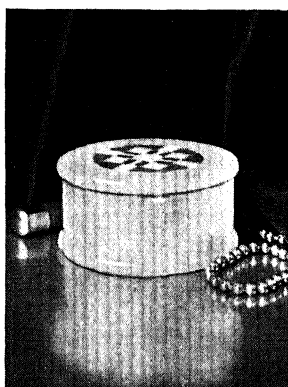
ALABASTER. There are two minerals known as alabaster, of different chemical composition, but much alike in appearance. Both are used for ornamental purposes. Alabaster proper is a special kind of gypsum (sulphate of lime), fine of grain, usually pure white in color, and very soft. It is used for vases, mantel ornaments, and as decorative building stone.



FORMS OF OLD ALABASTER VESSELS

In Europe deposits are found in Italy, England, and France; small quantities are quarried in New York and Nova Scotia. See GYPSUM.

The other stone, called *oriental alabaster* and *onyx marble*, is a carbonate of lime, of the same composition and formation as stalactites and stalagmites (which see). It is harder than gypsum alabaster, and often has bands of different colors. The ancients used it for statuary, ornaments, and building purposes. Florence, Italy, is the center of modern alabaster industries of these particular types.



MODERN USE
An alabaster powder box.

A.N.W.

ALACTAGA, a *lak' lah gah*, a species of jerboa (which see).

ALADDIN, a *lad' in*, one of the most popular of all the heroes of legend. He appears in one of the tales of the *Arabian Nights*, in which, from dire poverty as the son of a poor widow, he advances to wonderful wealth, because of the possession of a magic lamp and ring which he gains through his uncle, a wicked magician. Both the lamp and the ring, when rubbed, bring to his aid powerful genii, who are forced to do his bidding. Through his wealth he wins as a bride the daughter of the emperor of

China, and for her he orders the slaves of the lamp to build in one night a gorgeous palace. This is done, but later, when the princess is left alone in the house, she is deceived by the magician uncle, who gains control of the lamp and compels the genii to carry off the palace to Africa. The slave of the ring, however, brings back the palace and regains for Aladdin possession of the lamp, while the wicked magician meets his deserved fate. See ARABIAN NIGHTS.

In Literature. Allusions to Aladdin's lamp, both serious and humorous, abound in literature. Thus, Byron in *Don Juan* made use of the expression, "Yes! ready money is Aladdin's lamp," and Charles Swain, a minor poet, wrote:

Oh, had I but Aladdin's lamp,
Tho' only for a day,
I'd try to find a link to bind
The joys that pass away.

[In modern times, man is using science as Aladdin used his lamp, to obtain mastery over the forces of nature and produce a wealth of materials for the satisfaction of his wants. The achievements of modern science far surpass the fanciful tales of ancient magic, however fascinating they may be.]

ALAMEDA, a *la ma'dah*, CALIF. See CALIFORNIA (back of map).

ALAMO, *ah' lah mo*, the scene of a famous battle fought during the war for Texas independence, sometimes called the "Thermopylae of America." It was originally a Catholic mission, moved to the city of San Antonio from the Rio Grande by Padre Olivares, about 1718. The mission was at first called San Antonio de Valero and consisted of a monastery and church, enclosed by high walls. It had been built by Franciscan monks. The name *Alamo* was given because the place was surrounded by cottonwood trees, *alamo* being the local name for the species.

After its establishment in San Antonio, the mission was occasionally used as a fort. During the war for Texas independence, in 1836, the Mexican General Santa Anna, with an army estimated at from 4,000 to 6,000 men, invaded Texas. A company of 163 Texans under Lieut. Col. William Barrett Travis made a stand in the Alamo in order to give Gen. Sam Houston time to organize the army of Texas. The border heroes, James Bowie and Davy Crockett, were in the company. J. B. Bonham and nineteen others from Goliad fought their way in.

The siege lasted from February 23 to March 6. Only one man elected to try to escape, and he was never heard from. The little garrison of 183 died to a man for the independence of Texas. So it is said, "Thermopylae had her messenger of defeat; the Alamo had none." On March 6, with ammunition practically exhausted, they resisted with clubbed muskets until all but six men were killed. These, including Davy Crockett, were at once put to death by Santa Anna's order. The only sur-

vivors were Mrs. Dickinson, wife of one of the officers, her baby, her Mexican nurse, and a colored boy. This heroic defense gave General Houston time to organize his army, and on April 21, at San Jacinto, not far from Houston, he utterly routed Santa Anna and drove his army from Texas. "Remember the Alamo"



Photo: U & U

THE HISTORIC ALAMO

was the battle cry that inspired those who won independence for Texas.

This historic structure stands in the center of San Antonio. It has been purchased by the state and restored as far as possible as it was left by the siege. It ranks with Independence Hall and Bunker Hill as one of the monuments of American liberty. See page 7121.

Related Subjects. The reader is referred in these volumes to the following articles:

Crockett, Davy	Texas (History)
Houston, Sam	Thermopylae

ALAND ISLANDS, a small archipelago in

the Baltic Sea, at the entrance to the great Gulf of Bothnia, under the sovereignty of Russia until the Bolshevik revolution (1917). After the downfall of the czar's government, their status for a time was uncertain. Sweden claimed the islands, because of ownership prior to 1809, and the new republic of Finland also demanded them. The Council of the League of Nations, in June, 1921, awarded them to the latter country, regardless of the facts that a majority vote of the islanders had favored annexation to Sweden, and that ninety-six per cent of the people speak the Swedish language. The determining factor in the League Council was that the archipelago geologically is a continuation of the Finnish mainland. This is the first time in history that a territorial award has completely ignored nationality in favor of geological formation.

In placing Aland under Finnish sovereignty, it was decreed that no military allegiance should be required of the people, and full local self-government should be guaranteed. The area of the archipelago is 551 square miles; population, 27,500.

AL'ARIC I (?-410), the famous barbarian warrior who led the Visigothic invasions in Greece and Italy. In his second invasion of Italy, in 410, his army entered Rome in triumph, and sacked it for three days. Though a pagan, Alaric generously spared the religious temples in his destruction of many of the Greek and Roman cities. His victories in the western part of the Roman Empire paved the way for the conquest of the Romans in the Iberian peninsula and the founding of the Visigothic kingdom in Spain. See **GOTHS**, subhead.



ALASKA. This largest outlying possession of the United States is a territory rich in natural resources, but when purchased from Russia in 1867, it was derisively referred to as "590,000 square miles of icebergs and polar bears." William H. Seward, the American Secretary of State, negotiated the purchase for \$7,200,000; when his opponents called Alaska "Seward's folly" he declared that he considered his service in acquiring the territory the most important act of his official career.

The area of Alaska is 590,884 square miles, one-fifth as large as the United States, and the purchase price was less than two cents an acre. While considerable of its area probably never will be worth even so insignificant a sum,

vast stretches already have released value that rivals "the wealth of the Indies," and no man will risk an estimate of the riches the territory holds for the future. Merely from an investment standpoint, Alaska has paid astounding dividends on the original investment. Since 1880, from gold and copper alone, the territory has yielded over \$568,000,000. Other resources of great value, referred to later in this article, increase the returns from industry by many millions of dollars yearly.

[The region had formerly been called Russian America, but Senator Charles Sumner of Massachusetts suggested a new name, *Alaska*. The word is an English corruption of the native Aleut *Al-ay-ek-sa*, meaning *great land*, or *mainland*, which was applied

somewhat vaguely to the entire region, but more particularly to the long, narrow strip now known as the Alaska Peninsula.]

A Brief Survey of the Territory. Alaska is more than twice as large as the state of Texas and slightly smaller than the combined area of Alberta and British Columbia. It is a more or less regular rectangular mass, approximately 800 miles long and wide, exclusive of the long, narrow extensions to the southeast and to the southwest. Its ocean coast line is longer than that of the entire coast line of continental United States.

This northern territory is still regarded by many people as a land of gold, fur seals, snow, and ice. This popular conception is true, but it is only part of the truth. It is no more a polar country than are Norway and Sweden, which lie in almost the same latitude. Point Barrow, the northernmost point of Alaska, is more than 1,200 miles from the North Pole, about the same distance from it as is the North Cape; and the southernmost point of the mainland is in the latitude of Glasgow and Moscow. Its location in an east-and-west line is little appreciated, for it lies entirely to the west of the United States. Its easternmost point is 600 miles west of San Francisco, and the westernmost point of the Aleutian Islands is in the longitude of New Zealand.



LOCATION MAP

Showing size with respect to the entire continent of North America.

Alaska is itself a vast peninsula, but the name *Alaska Peninsula* is restricted to the extension in the southwest, beyond which lie the Aleutian Islands. These islands form a large part of the boundary between Bering Sea and the Pacific Ocean. The northern shores of Alaska are washed by the Arctic Ocean. On the southeast are the islands of the Alexander Archipelago and a long strip of the mainland, which extends southward and shuts off nearly half of British Columbia from the Pacific Ocean.

The People. The total population according to the census of 1920 was 54,899, which provided an average of but one person to nine square miles. This was a decrease of 9,457 from that of 1910; it represents a decrease both in white population from the states and in the native population to a slight degree. The Chinese are less numerous than formerly.

About one-third of the total population is foreign-born or native-born of foreign parents, and a little more than one-half is white. Swedes, Norwegians, Canadians, Germans, and Irish are the leading foreign elements, in the order named. Five-sixths of the whites are males.

The natives of Alaska may be divided into four great stocks or groups—the Aleuts, Eskimos, Thlinkits or Tlinkits, and Athapascans. The last group, which numbers about 4,000, is one of the North American Indian families. The Aleuts, famous as boatmen and hunters of the sea otter, live only on the Alaska Peninsula and the Aleutian Islands. They have slowly decreased in number, until only 1,500 are left. The 5,000 Tlinkits and the 500 Haidas, an allied stock, live in Southeast Alaska. The best known and the most numerous of these groups are the Eskimos (which see). They live chiefly along the shores of Bering Sea and the Arctic Ocean.

The spiritual, moral, and economic condition of the natives has been a burden upon the white people since the first days of Russian occupation. Many of the native Alaskans early became Christians of the Greek or Russian Orthodox Church. Since 1867 many other religious denominations have established missions, and to-day practically the entire native population at least professes Christianity. Schools were formerly maintained in connection with nearly all missions, but most native schools are now under the control of the United States Bureau of Education. The introduction of the Siberian reindeer, more valuable than the caribou, is also the work of this Bureau. Another factor which helped the condition of the natives was the rigid enforcement of laws prohibiting even the gift of intoxicating liquors to them, prior to territorial prohibition in 1916.

Most of the natives live in small settlements, and have severed most of their tribal relations. Many of the settlements are near to the cities and towns built by the whites. The larger towns are up-to-date; they have (for that northern clime) good stores, and are equipped with electric lights, paved roads, museums, libraries, fire departments, daily and weekly newspapers, moving pictures, and theaters.

Teachers of the Natives. In native Eskimo and Indian communities the school is the center of all social, civic, and industrial activity. The teacher (from the states) is guide, leader, and everything else the settlements may demand. He or she must also be emergency physician, business manager, nurse, and community builder, to the extent of ability. As a result of the self-sacrifice of these heroic people, one encounters to-day settlements of self-respecting natives which replace the squalid villages of former days. Closely associated with over 150

teachers are a few physicians, nurses, nurses in training, hospital attendants, and herders in charge of reindeer (which are under control of the Bureau of Education).

Alaska's Towns. There are in the territory seventeen incorporated towns and nearly 175 unincorporated places; the latter include native settlements. Only seven villages have populations exceeding 1,000 each.

Anchorage, on Cook Inlet, in the southern part of the territory, is one of the rapidly growing towns. It is on the Alaskan Railroad, north of the coast village of Seward, and is the largest town on the railroad, except Fairbanks, the northern terminus, which now holds a numerical advantage over Anchorage. Anchorage did not exist as a village in 1910; it has 1,850 people.

Fairbanks, the largest town in the interior of the territory, the center of a great mining district. It is the seat of the Fourth Judicial District, which comprises all the interior of the territory, and is situated just halfway between the north and south coasts. The town is on the Chisana River, a branch of the Yukon, and during the five open months of summer has steamboat connection with Saint Michael, north of the mouth of the Yukon, and with Dawson and other points on the Upper Yukon, and is the northern terminus of the Alaskan Railroad. An older railroad runs from Fairbanks forty-five miles into the gold fields.

Fairbanks has electric lights, telephones and the telegraph, a central steam-heating plant, and other modern conveniences. In 1910 its population was over 3,500; it has decreased to about 2,500.

Juneau, *joo no'*, the capital of the territory, is situated on the southeastern coast, about 160 miles north of Sitka, the old capital, and is the seat of one of Alaska's judicial districts. It is a mining and fishing center, and is a base of supplies for a wide region. There are good wholesale and retail stores, an electric-light system, telephone exchange, churches, public schools, daily newspapers, a library, radio station, and police and fire departments. It is an important supply station, and has steamship connection with all the Alaskan ports and with Seattle and other cities on Puget Sound. The temperature in winter is milder than in many cities in the central part of the United States which are a thousand miles farther south. The town was settled in 1880 and incorporated in 1900. Population, about 5,000.

Ketchikan, a port of entry almost at the southeastern point of the territory, on the island of Revillagigedo. It has the modern elements of towns farther south—electric lights, banks, churches, schools, and newspapers, and is the center of trade for adjacent mining districts. The temperature, as a rule, falls below the freezing point only in December. Rainfall approximates 125 inches or more a year. Population, 2,500.

Nome, *nohm*, a city on Bering Sea, south and east of Bering Strait, on the southern coast of Seward Peninsula, the westernmost projection of the territory. Nome is not only the largest town on the peninsula, but is the commercial, educational, and judicial center of Western Alaska. It is situated in a prosperous gold-mining district, and in the vicinity are also found tin and copper. Seattle, Wash., is 2,396 miles distant; the two cities enjoy steamer connection between June and October. Nome began as

a mining camp, the first settlement having been made in 1899, when valuable beach deposits of gold were discovered. It now has modern sewerage, water and electric-light systems, radio and telephone service, and a railway extending to Shelton, eighty-five miles north. The population is 875, but during the early rush of gold-seekers, when discoveries were made in the Klondike region, more than 12,000 people were in Nome.

Sit'ka, the seat of government under Russian rule, and continued as the capital after the United States acquired the territory, until 1912. It is situated on the western coast of Baranof Island, in a mountainous region in the southeastern peninsula. Juneau, the present capital, is 160 miles northeast, and Seattle is 1,130 miles south. The place is the outgrowth of a Russo-American trading station established in 1799, which was then called Archangel; there yet stands a Russo-Greek church that was built in 1816. Its history as a permanent settlement dates from 1804. Sitka has an agreeable climate, with winters often more temperate than in the central part of the United States, a thousand miles south.

The chief industries of the place are lumbering, mining, and the canning of salmon. It is the seat of the Alaskan Agricultural Experiment Station and of the Coast Survey Magnetic Base Station, and the headquarters of the Episcopal bishop of Alaska. Among the notable features are the Sheldon Jackson Museum, maintained by the Presbyterian Mission, and an industrial school for natives (Presbyterian). There is radio and cable connection. Population, 1,175, of whom about 200 are whites.

Physical Characteristics. Alaska is divided into four parts, each of which has individualities of surface and climate. These divisions are described below:

1. **Pacific Coast.** Practically the entire southern coast, from the westernmost of the Aleutian Islands to the Portland Canal, is mountainous. The coast is not unlike that of Norway, cut by many rocky fiords and straits, and its rugged beauty is the delight of thousands of visitors. Between the mountains and the sea is only a narrow ledge or shelf, and in many places the mountains rise abruptly from the water's edge to a height of 15,000 feet or more. There are many islands along the coast, the largest of which are Kodiak, in the southwest, and Baranof, Prince of Wales, Chichagof, Kupreanof, Revillagigedo, and Admiralty (which see), in the southeast.

This remarkably picturesque region is composed of four connected mountain chains, which vary from 50 to 200 miles in width. The long strip between British Columbia and the sea, which is called Southeast Alaska, or the Panhandle, has the Coast Range. This has no well-defined watershed, but has many peaks from 5,000 to 8,000 feet high. The Alexander Archipelago is the remains of a separate, partly submerged chain of mountains, but is usually included in the Coast Range. North of the Chilkat River and Cross Sound is the Saint Elias Range, which has its western end in the Kenai Peninsula. This range has many famous peaks—Mount Fairweather (15,290 feet), Mount Vancouver (15,666 feet), Mount Wrangell, an active volcano (17,500 feet), and Mount Saint Elias (18,024 feet), whose summit is on the international boundary. The Panhandle and the Saint Elias Range have thousands of glaciers, which fill the upper valleys. Many of them reach to the



Photos: U & U

What One May See in Alaska. Na-Wad-Lik and Wenga, happy little Eskimo maidens at Nome. Lovers' Lane at Sitka; totem poles add to the beauty of the view (see **TOTEM**). Front Street in Ketchikan, paved for a part of its length with planks.



Photo: U & U

THE BOAT OF THE ALASKAN NATIVES

It is called a kyak, and is constructed of skins stretched tightly over a framework of bone or wood. By means of a hood fastened over the seat and reaching to the neck of the occupant, the boat can weather severe storms without admitting water; in fact, expert rowers can turn the boat entirely over and bring it into position again without danger to themselves. The natives make long sea voyages in these frail crafts.

sea, into which they discharge huge icebergs, and perhaps a hundred or more are separated from the coast only by a terminal moraine (see GLACIER). A traveler has written:

In Alaska a glacier is a wonderful torrent that seems to have been suddenly frozen when about to plunge into the sea. Down and down mountains wind these snow-clad serpents, extending miles inland, with as many arms sometimes as an octopus. . . . Think of Niagara Falls frozen stiff, add thirty-six feet to its height, and you have a slight idea of the terminus of Muir Glacier.

The third of the Pacific ranges is the Aleutian, the backbone of the Alaska Peninsula. It ends in the partly sunken Aleutian Islands. The Alaska Range lies a little farther inland, and like the Aleutian Range, has a number of active volcanoes. Its southern end is not noteworthy, but in the north it culminates in Mount McKinley (which see), the loftiest peak in North America.

2. **The Central Plateau, or Continental Alaska.** North and east of the coast mountains is a vast plateau, almost the whole of which is included in the basin of the Yukon River. Only a low watershed divides the Yukon basin from the Kuskokwim, the second river in size. The plateau extends practically across the territory from east to west and has an average width of 200 miles. Near the base of the mountains it has an elevation of 4,000 to 5,000 feet, but gradually declines to 1,000 feet, near Bering Sea. Much of the country is a rolling plain, cut into many table-lands by the deep, broad valleys of the rivers.

3. **The Rocky Mountains.** East and north of the central plateau are the Rocky Mountains. On the east they lie almost wholly in Canada, but near the Arctic Ocean the range turns at right angles. It extends westward and southwestward in two parallel chains called the Endicott Range. As they approach the ocean on the west, these two chains separate, the northern being known as the De Long Mountains, and the southern as the Baird Mountains.

4. **The Arctic Slope.** North of the Endicott Range is the only true Arctic section of Alaska. Its southern

part, a belt about eighty miles wide, is a plateau, with a maximum altitude of 2,500 feet near the foothills of the mountains. In the north the plateau ends abruptly, and beyond lies an uninteresting coastal plain which extends to the Arctic Ocean. Neither the plateau nor the coastal plain has yet been fully explored.

Climate. The great differences in the character of the surface have an important influence on the climate, and consequently on the plant and animal life. Only in the northern fourth, or possibly third, is the climate distinctly Arctic. Except for about two months in midsummer, the Arctic Ocean is closed by ice, and the average annual temperature is 24° F. below freezing, or 8° above zero. On the Arctic coast, rainfall is only eight to ten inches a year, but along Bering Sea it is from twenty to thirty inches.

The interior has less rainfall and great extremes of temperature. At Eagle, near the Canadian boundary, temperatures of 90° F. in summer and -50° F. in winter are not rare. Throughout the basin of the Yukon, the first of October marks approximately the beginning of winter. The snowfall is heavy, and from December to March the average temperature is -20° F. In May the rivers thaw, and summer comes quickly in June. The Alaska summer is a season of almost unbroken daylight. The sun shines brilliantly for eighteen to twenty hours a day, and in the remaining hours there is twilight. Clouds are practically unknown. Even in summer, however, the nights are cool, and frosts in July are not uncommon.

The climate in the coast regions is far different. Southeast Alaska has a temperate climate, like that of the coast of Northwestern United

States, and the thermometer seldom registers higher than 75° or lower than zero. At Sitka, because of the warm ocean winds, the temperature averages about the same as at Washington, D.C., although it is over a thousand miles farther north.

The moist winds from the southwest bring abundant rains along the coast and heavy snows on the south slopes of the mountains. The rainfall averages more than ninety inches a year, and even when there is no rain there are heavy fogs. At the western end of the Aleutian Islands, it rains or snows most of the time—according to one observer at least on five days in each week. The southern part of Bering Sea is always foggy, but to the north the moisture in the air rapidly decreases. There is no record that any person ever saw sunshine on Agattu Island, of the western Aleutian group.

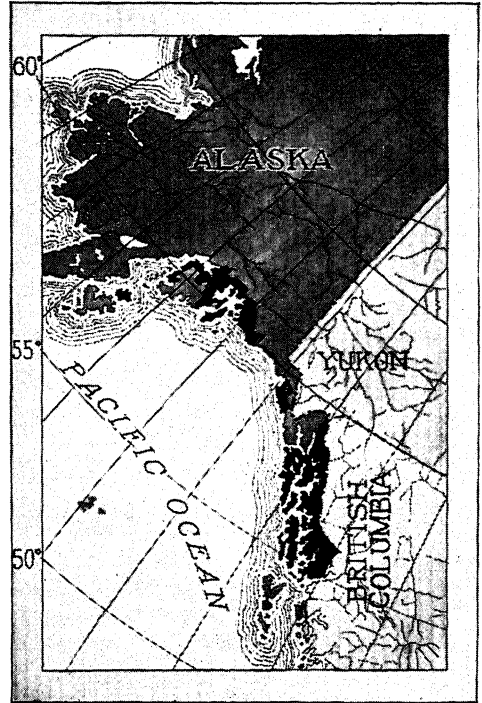
Animal and Plant Life. The animal life of Alaska includes an astonishing variety of mammals, birds, insects, and other classes. In the interior, swarms of flies, mosquitoes, and gnats make life miserable during the summer months. Moose are still seen occasionally in the forests, and deer are found in the southeast. Caribou were formerly plentiful, and before the coming of the white man constituted almost the sole support of the natives. Their meat was food; their skins were made into clothing, and their bones into needles and other simple tools. The destruction of the caribou herds by the white man finally threatened starvation for the natives. To prevent this disaster, the United States government imported large numbers of domestic reindeer from Siberia. These animals have thrived exceedingly well, and in part, at least, solve the problem of food and clothing; they now number more than 350,000 (see REINDEER). Among the smaller animals are wolves, foxes, beavers, weasels, and mink. The ptarmigans are plentiful, and eagles are common along the Pacific coast. Each animal here named is described elsewhere under its title.

Fisheries. It is the marine animals, however, which are of the greatest economic importance, especially the fur seal and the salmon. The home of the fur seal (which see) is the Pribilof Islands, and the value of the sealskins taken from these islands has already reached a total of over ten times the price paid by the United States for the whole of Alaska. So rapidly did the sealing industry grow that the extinction of the herd was threatened (see BERING SEA CONTROVERSY). Protective laws were passed, and by 1929 the American herd increased to nearly 810,000.

The whaling industry is no longer as important as in the early part of the nineteenth century, because the whales are fewer. The natives occasionally kill a whale for blubber.

Of the fishes taken in Alaskan waters, the

most important are herring, cod, halibut, and the most valuable of all, salmon. One of the largest salmon fisheries in the world is on Kodiak Island, on the Karluk River. The Nushagak River and Bristol Bay form another great salmon fishing-ground. The first salmon cannery in Alaska was built in 1878; since then the industry has steadily increased until the



THE GREAT FOREST AREAS OF ALASKA

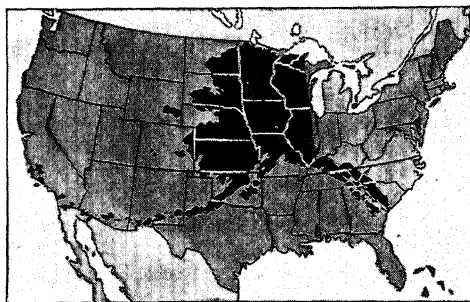
annual catch is now worth much more than the territory's annual yield of gold. The total value of the salmon catch from 1868 has been over \$400,000,000, over fifty times the original cost of Alaska. The catch of cod shows little variation from year to year, but the catch of herring and halibut is steadily increasing. The young herring are packed, in several towns, as sardines.

Plant Life. The plant life of Alaska shows great variety, considering the high latitudes. Explorer McMillan declares that the territory produces nearly 700 varieties of flowers during the short growing season. The Pacific coastal region, especially in the southeast, has rich forests of hemlock, spruce, and red cedar, with considerable willow and cottonwood. Probably the most characteristic Alaskan tree is the tide-land, or Sitka, spruce. The interior has extensive areas of black and white spruce, poplar, white birch, and alder. To conserve timber and assure careful cutting, national forests have been established. The Tongass

National Forest includes Southeast Alaska, and the Chugach extends from Cook Inlet to Controller Bay. Forests cover 20,000,000 acres, sufficient to produce for many years 2,000,000 cords of pulp wood annually.

The remainder of Alaska has few trees. Near the Arctic Circle the willows become mere shrubs two or three feet high, and all other trees are gnarled and small. Grasses are abundant in many sections, but the most distinctive features of the plant life are the mosses, which cover one-fourth of all Alaska. These vary in color from pure white to deep brown and green. The tundras, which include the coastal region from the Aleutian Islands northward to Point Barrow and eastward to the Canadian boundary, are covered with brown peat moss, herbs, and sedges. During the short summer, these mosses are dotted by countless millions of wild flowers.

Agriculture in Alaska is as yet in its early development, but there is no doubt as to its possibilities. Near the towns are truck farms, and hardy vegetables and cereals are raised with much success. Strawberries and other fruits are raised throughout Alaska, and barley and oats grow well throughout the larger part of the southern half of the territory. Cattle-raising is becoming a flourishing industry around Cook Inlet and other favored sections, where native grasses grow in profusion.



COMPARATIVE AREAS

Maps drawn to the same scale show the surprising extent of Alaska's domain.

Mineral Wealth. Though the existence of mineral deposits was known to the Russians, no serious attempt was made to develop these resources until after Alaska became the property of the United States. Gold was first mined extensively at Juneau, after 1880, and in the next fifteen years was discovered and mined in many other sections. The coast region was for a long time the center of production.

The discovery of the Klondike gold fields, near the boundary between the United States and Canada, is really an event in Canadian history, but it drew hundreds of prospectors to Alaska proper. In 1890 placer gold was first found at Nome, and in that year and the next,

hundreds of prospectors found golden fortunes. The gold production of Alaska in 1899 was double that in 1898. Other fields have since been discovered, the most important being the Fairbanks camp, on the Chisana River, one of the tributaries of the Yukon. Nearly all the large gold-mining camps are in the Yukon basin or on Seward Peninsula. Placer mining is still the rule, but increasing attention is being given to deep veins. The production in recent years has declined, for the output now does not usually exceed \$17,000,000 a year, a decline of nearly fifty per cent from the "bonanza" days. The output of silver is about \$450,000 a year.

Coal. The estimated area of the Alaskan coal fields is 20,000 square miles. The most important deposits are along the Bering River, twenty-five miles east of Controller Bay, and along a small stream which empties into Cook Inlet. The coal in these regions is good bituminous and semi-anthracite, but in the other known fields it is of lower grade. The development of this resource has been prevented by lack of transportation facilities and by the many changing restrictions which have been fixed by the United States government (see, below, *History*).

Other Minerals. Copper is now more important to Alaska than gold in average years. The metal was first mined in 1901 on Prince William Sound, and the annual product ranged from 20,000,000 to 30,000,000 pounds for several years before the record year of 1915, when it amounted to more than 80,000,000 pounds. Most of it comes from the Copper River district, but about half the producing mines are in the Ketchikan region, in the extreme southern part of the territory. Tin and antimony, though still of slight importance, are produced in increasing quantities. Petroleum has been found near the Copper River.

Commerce and Communication. Alaska has large natural resources, as indicated in the preceding description, but until recently it has had scarcely the beginnings of adequate transportation facilities. In 1899 and 1900, for example, when the gold fields along the Chisana were first being worked, it cost one cent per pound per mile to transport supplies from Circle City to the mines. As the distance was 125 miles, this meant a charge of \$2,500 to transport one ton. The situation later improved, as several thousand miles of sled and wagon roads have been built, but the railway mileage in 1914 was only 485. In that year, however, Congress authorized the construction of 1,000 miles of new government-owned railways and the purchase of the existing lines. Surveys were made promptly, and in April, 1915, the new rail route was determined, from Seward, on Resurrection Bay, to Fairbanks, a distance of 543 miles. There are three mining branches, aggregating about eighty miles in



Photos: U & U; Wide World

In the Great Northern Territory. This is the famed dog team which carried serum to Nome during an epidemic of diphtheria; the route covered a hundred miles of desolate, frozen, and almost unmarked trails. In the center is shown a fine specimen of reindeer, in his winter coat of white. Below is a trestle on the Alaskan Railroad.



Photo: Visual Education Service

SEAL HUNTING NEAR NOME.

length. This is the only railroad owned and operated by the national government, except the Panama Railroad.

Eskimo dogs are still in isolated parts of Alaska the chief motive power for transportation.

In the past, the rivers have been of great importance, particularly the Yukon and Kuskokwim. These two, with their tributaries, provide navigable waterways about 5,000 miles long. The rivers are free from ice only for four to five months in the year, but this period is long enough for the needs of the valleys.

Telegraph and radio connect nearly all towns. The government has installed eight radio stations, and nineteen cables also supply communication with Canada and the United States.

Trade and commerce are confined largely to the exportation of raw products and the importation of supplies. Gold and fish are sent chiefly to Seattle, Tacoma, and San Francisco, and these ports ship machinery and other manufactured goods in return.

Government. From 1867 to 1912 Alaska was an unorganized territory; all of its officers were appointed by the President of the United States and all its laws were made for it by Congress. On August 24, 1912, President Taft approved an act of Congress organizing the territory and providing self-government. The capital was fixed at Juneau, where the legislature meets in the odd-numbered years. The Senate is composed of eight members, chosen for four years, and the House of Representatives has sixteen members, chosen for two years. The governor, appointed by the President, may veto any act of the legislature. All laws must be approved by Congress before they go into effect. At its first session, in 1913, the legislature granted suffrage to women on the same terms as men, in advance of the Federal amendment. Alaska

sends one delegate to the House of Representatives at Washington (see **DELEGATE**).

In 1927 a law defining the qualification of voters became effective. In order to vote, a person must be able to write in English and to read the Constitution of the United States in English.

Communities of more than 300 people may incorporate as towns and conduct their own local affairs. With this exception, there is no local government. There are four Federal judges appointed by the President, one for each of the judicial districts; the courts are held at Juneau, Nome, Valdez, and Fairbanks.

Alaska suffers from a division of authority and control exercised at long distance. More than thirty bureaus in Washington control the destinies of the territory, and residents refer to themselves as "political footballs."

Other Points of Interest. Measured in degrees of longitude, the difference between the most easterly point of Alaska and the most westerly point of its island chain is greater than that between New York and San Francisco; but the distance in miles, 2,650, is about 600 less, since Alaska is much farther north, where the degrees are shorter.

Warren G. Harding was the only President of the United States to visit Alaska. He made the trip in 1923 and died in San Francisco, on the homeward journey.

Mail is regularly delivered beyond the Arctic Circle by dog sledges. Delivery by airplane is feasible; there are over forty aviation fields for commercial flying.

In ancient geologic times, Alaska was the home of great herds of mammoths, those huge, hairy elephants which were so much larger than any animals that exist to-day.

Scientists say that the Yukon carries to the sea almost as much water as does the Missis-

issippi, and that its vast floods keep the sea water fresh several miles from the coast.

The latitude range of Alaska is nearly as great as from Duluth to New Orleans.

History of Alaska

Alaska is the only part of the New World which was discovered and first explored by white men who came from the West. The Russian Cossacks are thought to have reached the Alaskan coast about the last quarter of the sixteenth century, but it was not until 150 years later that real explorations began. The most famous of the explorers was Vitus Bering (whose career is sketched in these volumes, on page 712). The first settlement was made on Kodiak Island in 1783, and during the next fifty years exploration continued. The English and Canadians, coming from the East, reached the Pacific through the river valleys, the Russians continued to cross Bering Strait, and Frenchmen, Spaniards, and Englishmen also sailed northward along the Pacific coast.

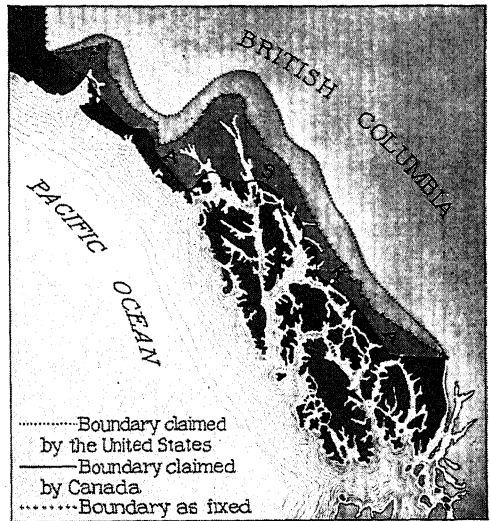
The most important of these early exploring trips was that of Captain James Cook, who surveyed almost the entire coast line from Cross Sound to Cape Lisburne. The explorations of Sir Alexander Mackenzie, George Vancouver, and Sir John Franklin were also noteworthy. The Russians explored the lower courses of the great rivers, and employees of the Western Union Telegraph Company did valuable work in 1865 and 1866. It was planned to connect Europe and America by telegraph through Alaska and Siberia, and the work of exploration and laying out a course was well under way when the success of the Atlantic cable put an end to this plan.

Purchase by the United States. Russian official interests in Alaska were concerned only with the fur trade. In 1788 the Russo-American Company was given a monopoly of the trade, which it held until 1861. The vast region was regarded by the Russians only as a source of furs, and when the supply of these began to show signs of decreasing, the country was considered less valuable. Negotiations for its sale to the United States were begun as early as 1859, but it was not until 1867 that a treaty of sale was negotiated by William H. Seward, then Secretary of State. The United States paid Russia \$7,200,000 in gold.

There was bitter opposition to this purchase, for many Americans, then as now, believed Alaska to be a useless mass of rock, snow, and ice. Fortunately, the opposition was defeated. In the forty years following 1867 the United States government received directly, merely from the taxes on sealskins and other sources, nearly double the purchase price. Some facts touching vast resources yet untouched, as well as returns from industry up to the present time, are referred to earlier in this article.

In the Panhandle region there are literally thousands of glaciers, over a hundred of which almost reach the sea. (In the article *GLACIER*, illustrations will be found.)

Boundary Dispute. In 1825 Russia and Great Britain by treaty fixed a boundary between British and Russian territory in North America. For sixty years there was no quarreling over the interpretation of the treaty, although the Russian rights had meanwhile been transferred to the United States. For sixty years the boundary, from Mount Saint Elias southward, had been a line ten leagues



THE BOUNDARY DISPUTE

Showing conflicting claims and final adjustment.

(thirty miles) inland from the coast. This line followed all the windings of inlets and promontories. About 1885 Canadians began to assert that the boundary was incorrect, and in 1888 the Canadian government formally called the attention of the United States to this difference of opinion. The boundary, it was asserted, should be ten leagues east, not of the actual winding shore line, but of a line drawn from headland to headland. Such a line would place the heads of many inlets in Canadian territory and would leave the United States with but a few islands and broken strips of mainland.

The disputed territory was at once surveyed, but a crisis did not come until 1896, when the gold discoveries in the Klondike brought thousands of prospectors and made a Pacific outlet of greater importance to Canada. The Alaska boundary was one of the problems discussed by the Joint High Commission [see *CANADA (History)*], but the commission was unable to arrive at conclusions. Finally, in 1903, a

POSSIBLY THE MOST ROMANTIC LANGUAGE EVER USED IN A LAW

The Territorial Legislature of Alaska passed this act April 28, 1917, and the governor of Alaska approved it. It is more interesting than most state documents:

An Act

DESIGNATING and declaring the forget-me-not to be the Territorial and floral emblem of Alaska.

A little flower blossoms forth on every hill and dale,

WHEREAS, throughout her more than one-half million square miles of territory, stretching from the Pacific to the Arctic Ocean and from Canada's border to Bering Sea, Alaska has a wild flower which grows on every hill and in every valley; and,

The emblem of the Pioneers upon the rugged trail;

WHEREAS, this flower is emblematic of the quality of constancy, the dominant trait of the intrepid pioneers, who, in spite of almost insurmountable obstacles and insufferable hardships, have opened for development a nation's treasure house; and,

The Pioneers have asked it and we could refuse them not:

WHEREAS, the Grand Igloo of the Pioneers of Alaska have indorsed this floral gem as the Territorial flower of Alaska,

So in thinking for an emblem
For this empire of the North
We will choose this azure flower
That the golden days bring forth.
For we want men to remember
That Alaska came to stay,

Though she slept unknown for ages
And awakened in a day,
So, although they say we're living
In the land that God forgot,
We'll recall Alaska to them
With our blue forget-me-not.

—DARLING

Therefore,

Be it enacted by the Legislature of the Territory of Alaska:

So the emblem of Alaska is the blue forget-me-not.

Section 1. That the wild native forget-me-not is hereby made, designated, and declared to be the Territorial flower and floral emblem of the Territory of Alaska.

Approved April 28, 1917.

special Alaska Boundary Tribunal was appointed to settle the meaning of the original treaty between Russia and Great Britain. Great Britain's representatives were Baron Alverstone, then Lord Chief Justice of England, Sir Louis A. Jette, and Hon. Allen B. Aylesworth, two distinguished Canadians. The United States was represented by Henry Cabot Lodge, Elihu Root, and George Turner. The decision of this tribunal favored the United States, Baron Alverstone voting with the American commissioners. About one-third of the disputed section was given to Canada when the boundary line was surveyed, this survey being completed in 1914.

Development of Coal Lands. The attempts to open up the great coal fields of Alaska aroused a bitter controversy which practically

prevented the development of this resource. In 1900 the public-land laws, so far as they affect coal-bearing areas, were extended to Alaska. These laws, however, were ineffective, because they applied only to surveyed land, whereas the Alaska coal fields were unsurveyed. A supplementary act of Congress in 1904 remedied this defect by allowing individuals to make private surveys as a basis for locating 160-acre claims. Late in 1906 an executive order, issued by President Roosevelt, withdrew all coal lands from entry, but was amended by a later order which exempted any claims located before November 12, 1906. The reason for this change of policy was the desire to eliminate fraudulent claims. In the two and a half years during which the act of 1904 was in force, practically all of the Bering River coal field

ALASKA

Adak Island.....	M 5	Cape Fanshawe, 50....	O 4	Eaton.....	G 3	Jimtown.....	K 2
Adak Strait.....	M 5	Carlisle Island.....	E 5	Edgcombe, Cape.....	N 4	Juneau.....	O 4
Admiralty Island.....	O 4	Carolus, Point.....	O 1	Edward, Cape.....	O 2	Juneau capital, 3,058..	O 4
Afognak, 308.....	J 4	Chacon, Cape.....	R 3	Egawik.....	G 2	Kachemak Bay.....	J 4
Afognak Island (United States Fishery and For- est Reserve).....	K 4	Chandler River.....	K 2	Ekuk.....	H 4	Kadiak Island.....	J 4
Agatut Island.....	K 4	Chandler River, East Fork.....	L 2	Elizabeth, Cape.....	K 4	Kagamit Island.....	E 5
Agivarik.....	H 4	Chandler Lake.....	J 1	Ellamar, 106.....	L 3	Kaguyak, 52.....	H 3
Akun Island.....	F 5	Chatanika, 150.....	L 2	Ephigenia Bay.....	O 5	Kanyuk Mountains.....	O 4
Akutan Island.....	F 5	Chatham Strait.....	P 2	Ernestine.....	L 3	Kake, 387.....	H 4
Alaganik.....	L 3	Chena, 18.....	L 2	Eska.....	K 3	Kakwak.....	H 2
Alaska, Gulf of.....	L 4	Chenega.....	K 3	Etolin, Cape.....	F 3	Kalla.....	H 2
Alaska Peninsula.....	G 5	Chernabura Island.....	H 5	Etolin Island.....	O 4	Kaltag, 89.....	H 2
Alaska Range.....	J 3	Chibukak, Cape.....	D 3	Etolin Strait.....	F 3	Kamishak Bay.....	J 4
Alatna River.....	J 2	Chichagof, Cape.....	H 4	Fairbanks, 1,155.....	L 2	Kanaga Island.....	M 5
Aleutian Islands.....	E 5	Chichagof Island.....	N 4	Fairweather, Cape.....	N 4	Kanektok River.....	G 4
Alexander Archipelago.....	O 4	Chickaloon, 300.....	L 3	Fairweather, Mount.....	N 4	Karluk, 99.....	J 4
Alitak Bay.....	J 4	Chicken, 10.....	M 2	Foraker, Mount.....	J 3	Kasaan, 126.....	R 3
Alsentia.....	J 4	Chignik, 85.....	H 4	Forrester Island.....	O 5	Kashaga, 51.....	F 5
Amatignak Island.....	M 5	Chignik Bay.....	H 4	Fort Egbert.....	M 2	Kaslof.....	K 3
Amchitka Island.....	L 5	Chilcoot Pass.....	P 1	Fort Gibbon, 181.....	J 2	Katalla, 84.....	L 3
Amliia Island.....	D 5	Chilkat.....	P 1	Fort Liscum, 153.....	L 3	Katmai.....	J 4
Amukta Island.....	D 5	Chilkoot.....	O 4	Fort Yukon, 319.....	L 2	Kayak Island.....	L 4
Amukta Pass (strait).....	D 5	Chiniak Bay.....	K 4	Foster Glacier.....	P 1	Kelly, Mount.....	G 1
Anagnak.....	H 4	Chirikof Island.....	J 5	Four Mountains, Islands of.....	E 5	Kena.....	K 3
Anaktuvuk River.....	K 1	Chisana River.....	M 3	Fox Islands.....	F 5	Kenai Peninsula.....	K 4
Anchorage, 1,856.....	K 3	Chistochina.....	L 3	Franklin, 15.....	M 2	Kennecott, 494.....	M 3
Anchor Point.....	J 4	Chitina, 171.....	L 3	Franklin Point.....	H 1	Kern.....	K 3
Andreafski, 35.....	F 3	Chitina River.....	M 3	Frederick Sound.....	P 2	Ketchikan, 2,458.....	P 5
Andreafski Islands.....	M 5	Chitnak, Cape.....	E 3	Funder, 14.....	O 4	Ketchumstock.....	M 3
Anemuk.....	G 3	Chomly, 25.....	Q 3	Gakona.....	L 3	Ketchumstock Range.....	L 2
Aniakchak Bay.....	H 4	Chowiet Island.....	H 4	Gambell, 48.....	E 3	Keystone.....	L 2
Annette Island.....	R 3	Christian Sound.....	O 5	Gareloi Island.....	M 5	Khituk, Cape.....	F 5
Anvik, 140.....	G 3	Chugach Mountains.....	L 3	Gens de Large Lake.....	L 2	Killsnoo, 256.....	O 4
Anxiety Point.....	L 1	Chuginadak Island.....	E 5	Georgetown, 50.....	H 3	Kimball, Mount.....	L 3
Apollo.....	G 5	Chullitna River.....	K 3	Glacier.....	O 4	Kiska Island.....	L 5
Arctic City.....	J 2	Chuttle Cabin.....	J 3	Glacier Bay.....	N 4	Kiyavak Bay.....	J 4
Arctic Ocean.....	E 1	Cieare, Cape.....	L 4	Glass Peninsula.....	Q 2	Klahangamut.....	G 4
Atka Island.....	N 5	Circle, 96.....	L 2	Golden.....	L 3	Klawock, 19.....	O 5
Attu Island.....	K 5	Clarence, Port.....	F 2	Golovin.....	G 2	Klinkwaw.....	R 3
Augustine Island.....	J 4	Clarence Strait.....	Q 2	Good Hope Bay.....	G 2	Klondike Region.....	M 3
Aurora.....	K 4	Clark, Lake.....	J 3	Goodnews Bay.....	G 4	Knight Island.....	K 3
Avatanak Island.....	F 5	Cleave Creek.....	M 3	Great Sitkin Island.....	M 5	Kobuk River.....	G 2
Baird Inlet.....	F 3	Coal Harbor.....	G 5	Greig, Cape.....	H 4	Kodiak, 374.....	K 4
Baird Mountains.....	G 2	Coaling Station.....	G 5	Greville, Cape.....	K 4	Koggung.....	H 4
Baker.....	O 5	Cold Bay.....	G 5	Grindall.....	H 2	Kolmakott.....	H 3
Baker Island.....	O 5	Cold Bay, 200.....	J 4	Crimkop.....	O 5	Korovin Bay.....	N 5
Baranof Island.....	O 4	Coldfoot.....	K 2	Culkana, 50.....	L 3	Korovin Volcano.....	N 5
Barnabas, Cape.....	J 4	Colleen Mountain.....	M 2	Cuyot Glacier.....	M 4	Koserofsky.....	H 3
Barren Islands.....	K 4	Collie, Cape.....	G 1	Hagemeister Island.....	O 4	Kotlik, 83.....	G 3
Barrow, 322.....	H 1	Constantine, Cape.....	H 4	Hannes, 314.....	O 4	Kotsina.....	L 3
Barrow, Point.....	J 1	Controller Bay.....	L 3	Halkett Cape.....	K 1	Kotzebue, 230.....	G 2
Barter Island.....	M 1	Converden, Point.....	P 1	Hall Island.....	G 2	Kotzebue Sound.....	F 2
Barter River.....	L 1	Cook Inlet.....	K 3	Hamilton Landing.....	G 2	Koyukuk River.....	J 2
Batzulneta.....	M 3	Cook, Mount.....	M 4	Hayes, Mount.....	L 3	Koyukuk River, Middle Fork.....	K 2
Beaver City.....	J 2	Copper Center, 71.....	L 3	Hazen Bay.....	F 3	Kroto.....	K 3
Beaver Creek.....	L 2	Cordova, 955.....	L 3	Healy.....	G 3	Krusenstern, Cape.....	F 2
Beaver Dam.....	L 3	Cordova Bay.....	O 5	Healy Fork (Healy Station).....	K 3	Kruzof Island.....	N 4
Becharof Lake.....	H 4	Coronation Island.....	O 5	Healy Station (Healy Fork P. O.).....	K 3	Kudobin Islands.....	G 4
Beechey Point.....	K 1	Corwin, Cape.....	F 4	Heceta Island.....	Q 3	Kuguru River.....	L 1
Behm Canal.....	R 3	Corwin Coal Mine.....	F 1	Herbert Island.....	E 5	Kuiu Island.....	O 4
Belkofski, 129.....	G 5	Cosna.....	J 2	Herschel Island.....	N 1	Kulukak Bay.....	G 4
Beluga.....	K 3	Council, 109.....	G 2	Hinchinbrook Inlet.....	L 4	Kupreanof Island.....	Q 2
Bergman.....	J 2	Crillon, Mount.....	N 4	Hollis.....	O 5	Kupreanof Point.....	H 5
Bering Glacier.....	M 3	Cross Sound.....	N 4	Homer, 25.....	K 4	Kupuk River.....	F 1
Bering Sea.....	D 4	Curry.....	K 3	Hoonah, 402.....	O 4	Kuskokwim Bay.....	G 4
Bering Strait.....	E 2	Dahl.....	F 2	Hoonah Sound.....	P 2	Kuskokwim River.....	G 3
Berners Bay.....	O 4	Dall City.....	K 2	Hooper Bay.....	F 3	Kustatan.....	J 3
Bethel, 221.....	G 3	Dall Island.....	Q 3	Hope, 44.....	K 3	Kvichak, 15.....	H 4
Bettles, 25.....	J 2	Dall, Mount.....	J 3	Hope, Point.....	F 1	Latoche, 505.....	K 3
Big Black River.....	M 2	Dall, Point.....	F 3	Hot Springs, 29.....	J 2	Lay, Point.....	G 1
Big Koniuji Island.....	H 5	Dan Creek.....	M 3	Icy Cape.....	M 4	Lisburne, Cape.....	F 1
Biorka Island.....	F 5	Darby, Cape.....	G 2	Icy Point.....	N 4	Little Koniuji Island.....	H 5
Birch Creek.....	L 2	Deadwood.....	L 2	Icy Strait.....	O 4	Lockwood Mountains.....	J 2
Birches.....	J 2	Deering, 73.....	G 2	Iditarod, 50.....	H 3	Loring, 70.....	P 5
Bird Island.....	G 5	Deer Island.....	G 5	Igloo, 115.....	F 2	Lowestern, Cape.....	F 2
Blackburn, Mount.....	M 3	Demarcation Point.....	N 1	Igvak, Cape.....	H 4	Lower Ramparts.....	K 2
Black Peak.....	H 4	Dempsey.....	L 3	Ikolik Cape.....	J 4	Lynn Canal.....	O 4
Bluff.....	G 2	Denali.....	L 3	Ikpihpuk River.....	J 1	McCarthy, 127.....	M 3
Boundary River.....	N 2	Denison Creek.....	M 3	Iliamna, 66.....	J 4	McKinley, Mount.....	K 3
Bristol Bay.....	G 4	Deviation Peak.....	G 2	Iliamna Lake.....	J 4	McKinley National Park, 50.....	K 3
British Mountains.....	M 1	Dietrich River.....	K 2	Iliamna Peak.....	J 3	Makushin.....	F 5
Brooks Range.....	J 2	Discovery.....	H 3	Inara River.....	H 1	Malaspina Glacier.....	M 4
Cabin.....	M 3	Dixon Entrance.....	O 5	Indian Village.....	K 2	Manby, Point.....	M 4
Cabin.....	L 2	Dolomi.....	O 5	Indian Village.....	L 2	Manning Point.....	M 1
Cabin.....	H 2	Douglas, 919.....	O 4	Initilly.....	F 1	Manook City (Rampart), 121.....	K 2
Cabin.....	L 1	Douglas, Cape.....	F 2	Innokko River.....	H 3	Manook Region.....	K 2
Camden Bay.....	G 2	Duke Island.....	P 5	Isanotski Strait.....	F 5	Marmot Island.....	K 4
Candle, 91.....	H 4	Dutch Harbor.....	F 5	Jackson.....	Q 3	Mastodon.....	L 2
Canneries.....	P 2	Dyea.....	P 1	Jarvis.....	K 1	Mastodon Dome.....	L 2
Cannery.....	P 4	Eagle, 98.....	M 2			Matanuska, 200.....	K 3
Cannery.....	P 5	East Cape.....	E 3				

ALASKA *Continued*

Matanuska River.....	K 3	Pitt Point.....	J 1	Shelton Station.....	F 2	Togiak Lake.....	G 4
Meade River.....	H 1	Pogromni Volcano.....	G 5	Shettisham.....	O 4	Tolovana, 100.....	K 2
Meehan.....	L 2	Porcupine.....	N 4	Shishaldin Volcano.....	F 5	Tonki Cape.....	K 4
Melton.....	J 2	Porcupine Dome.....	L 2	Shishmaref Inlet.....	F 2	Tonsina.....	L 3
Mentasta Mountains.....	L 3	Porcupine River.....	M 2	Shumagin Islands.....	H 5	Treadwell, 325.....	O 4
Meshik.....	H 3	Portage.....	K 3	Shuyak Island.....	J 4	Treat Island.....	H 2
Metlakatla, 574.....	P 5	Portage River.....	J 2	Siepermo, Cape.....	E 3	Trinity Islands.....	J 4
Middleton Island.....	L 4	Portland Canal.....	P 5	Sillatch, Lake.....	K 3	Tununak.....	F 3
Miller House, 100.....	L 2	Prbilof Island.....	E 4	Simeonof Island.....	H 5	Turner River.....	M 1
Minchumina, Lake.....	K 3	Prince of Wales, Cape.....	F 2	Simpson, Point.....	R 3	Tustumena Lake.....	K 3
Mitkof Island.....	O 2	Prince of Wales Island.....	O 5	Sinuk.....	F 2	Tuxewaw.....	O 3
Mitrofanina Island.....	H 5	Prince William Sound.....	L 3	Sitka, 1,175.....	O 4	Twin Peaks.....	O 2
Mohican, Cape.....	F 3	Providence, Cape.....	J 4	Sitkalidak Island.....	J 4	Tzaharagamut.....	G 4
Montague Island.....	L 4	Pye Islands.....	K 4	Sitka Sound.....	N 4	Ugak Bay.....	J 4
Moose Pass.....	G 5	Quadra Island.....	O 5	Sitkinak Island.....	J 4	Ugashik.....	H 4
Morzhovoi, 60.....	G 5	Rampart (Manook City), 121.....	K 2	Skagway, 494.....	O 4	Ukak.....	J 4
Mountain Cape.....	F 5	Rapid City.....	J 2	Slana.....	L 3	Uliaga Island.....	E 5
Muir Glacier.....	O 1	Rapids.....	K 2	Sledge Island.....	F 2	Umnak Island.....	F 5
Mumtrahamut, 138.....	G 5	Red Fish Bay.....	P 2	Smith Bay.....	J 1	Umnak Pass (strait).....	E 5
Muzon, Cape.....	O 5	Red Fish Bay.....	P 2	Snettisham.....	O 2	Unalakleet, 285.....	G 3
Nagai Island.....	J 4	Resurrection, Cape.....	K 4	Solomon.....	G 2	Unalaska, 299.....	F 5
Naknek Lake.....	J 4	Revillagigedo Island.....	P 5	Soo City.....	K 2	Unalaska Island.....	F 5
Near Islands.....	F 3	Richardson.....	L 2	Southeast Cape.....	E 3	Unangashig.....	H 4
Nelson Island.....	F 3	Road House.....	H 3	Southwest Cape.....	E 3	Unanidak Bay.....	E 5
Nenana, 634.....	K 2	Rodman.....	O 4	South West End.....	F 5	Unga, 313.....	G 5
Nevikakat.....	J 4	Rodney, Cape.....	F 2	Spooner.....	G 2	Unimak Bay.....	G 5
Newenham, Cape.....	G 2	Romanzof, Cape.....	F 3	Star.....	M 2	Unimak Island.....	F 5
Niblack.....	O 5	Romanzof Mountains.....	L 1	Steel Creek.....	M 2	Unimak Pass (strait).....	F 5
Nicolai.....	J 3	Roosevelt.....	K 3	Steelmud.....	H 3	Union City.....	J 2
Nigaluk.....	K 1	Rothsals, Point.....	O 2	Stelias Range.....	M 3	Upright, Cape.....	E 3
Nikhkak.....	J 3	Russell, Mount.....	J 3	Steppings, Cape.....	F 2	Uyak.....	J 4
Nikolai.....	E 5	Sagak, Cape.....	E 5	Strelina.....	M 3	Valdez, 466.....	L 3
Nikolski.....	M 3	Saghadellautin.....	J 2	Stuart Island.....	G 3	Village.....	E 5
Nizina, 100.....	G 2	Sana Station.....	J 3	Suemez Island.....	P 3	Village.....	E 5
Nontak River.....	F 2	Saint Elias, Mount.....	M 4	Sulzer, 100.....	O 5	Village.....	L 2
Nohtalohon.....	F 2	Saint George Island, 138.....	E 4	Sumdum.....	O 4	Village.....	L 3
Nome, 852.....	F 2	Saint James.....	K 2	Sunrise.....	K 3	Vinasale.....	J 3
Nome, Cape.....	F 2	Saint Lawrence Island.....	E 3	Susitna, 48.....	K 3	Wales, 136.....	F 2
Nome Region, Cape.....	H 3	(Reindeer Station).....	E 3	Susitna River.....	K 3	Waring Mountains.....	H 2
Noonachagamit.....	H 3	Saint Matthew (Island).....	D 3	Sutwik Island.....	H 4	Warren Island.....	P 3
Noonamut.....	E 3	Saint Michael, 371.....	G 3	Taku.....	O 4	Washburn.....	L 2
Northeast Cape.....	E 3	Saint Michael Island.....	G 3	Talkeetna, 70.....	K 3	Wasilla, 100.....	K 3
North East Point.....	O 5	Saint Paul Island, 212.....	E 4	Talkeetna Mountains.....	K 3	West Cape.....	E 3
North Island.....	G 2	Salchaket, 10.....	L 2	Talsona.....	L 3	White Island.....	H 2
Norton Bay.....	G 2	Salisbury Sound.....	N 4	Tanaga Island.....	M 5	White Pass.....	O 4
Norton Bay Station.....	F 3	Sandpoint, 60.....	H 5	Tanaga Pass (strait).....	M 5	Whole Bay.....	P 2
Norton Sound.....	J 2	Sanford, Mount.....	L 3	Tanak, Cape.....	E 5	Willow.....	K 3
Nowi River.....	P 3	Sanak Islands.....	G 5	Tanana, 213.....	J 2	Windham.....	O 4
Noyes Island.....	J 2	Sawankto River.....	K 1	Tanana Crossing, 101.....	M 3	Woedsky.....	O 4
Nuklukavet.....	J 2	Scammon Bay.....	F 3	Tanana Hills.....	L 2	Wolasatux.....	H 2
Nulato, 258.....	F 3	Seaforth.....	K 2	Tanana River.....	K 2	Woodysk.....	O 2
Nunivak Island, 189.....	H 4	Sealevel.....	P 5	Tangent Point.....	J 1	Wortmans.....	L 3
Nushagak, 16.....	H 4	Segum Island.....	D 5	Taral.....	L 3	Wrangell, 821.....	P 4
Nushagak River.....	H 4	Segum Pass (strait).....	D 5	Tasununa.....	L 3	Wrangell, Cape.....	K 5
Nutchek.....	J 3	Selawik Lake.....	G 2	Tatitlik, 187.....	L 3	Wrangell Island.....	P 4
Nutzotin Mountains.....	M 3	Selawik River.....	H 2	Taylor, 50.....	F 2	Wrangell Mountains.....	M 3
Ocean Cape.....	M 4	Seldovia, 258.....	J 4	Teller, 80.....	F 2	Yakobi Island.....	O 1
Old Auke.....	O 4	Semichi Islands.....	K 5	Tenakee, 174.....	P 2	Yaktag, Cape.....	M 4
Old Tyonek, 58.....	G 2	Semidi Is.....	H 4	Tenakee Inlet.....	P 2	Yakutat, 165.....	M 4
Omalik.....	O 4	Semisopochnoi Island.....	L 5	Tetling.....	M 3	Yakutat Bay.....	M 4
Omaney, Cape.....	L 3	Seward, 652.....	K 4	Thetis Coal Mine.....	G 1	Yanert.....	K 2
Orca.....	J 4	Shakan, 23.....	O 4	Thomas Bay.....	Q 2	Yentna River.....	K 3
Orlova.....	G 3	Shakollik, 73.....	G 2	Thompson, Cape.....	F 1	York.....	F 2
Pastol Bay.....	G 3	Sheenjek River.....	M 2	Tigalda Island.....	F 5	York Mountains.....	F 2
Pastolik.....	G 5	Sheep Camp.....	P 1	Tikchik.....	H 3	Young, Mount.....	P 1
Pavlof Volcano (Smok- ing).....	L 3	Shelkof Strait.....	J 4	Tikchik Lake.....	H 3	Yukon Flats.....	L 2
Paxson.....	O 4	Shelton.....	F 2	Tikchik River.....	H 4	Yukon Hills.....	J 2
Petersburg, 879.....	G 4			Tin City, 100.....	F 2	Yukon River.....	G 3
Pierce, Cape.....	G 4			Toatut.....	F 2	Yunaska Island.....	E 5
				Togiak, 91.....	H 4	Zarembo Island.....	Q 2

OUTLINE AND QUESTIONS ON ALASKA

Outline

I. Location

- (1) Latitude— $54^{\circ} 40'$ to $71^{\circ} 31'$ north
- (2) Longitude— $129^{\circ} 58'$ west to $172^{\circ} 22'$ east (with islands)
- (3) Distance from North Pole

II. Size and General Characteristics

- (1) Area
 - (a) Comparative
 - (b) Absolute
- (2) Shape
- (3) Coast line
- (4) Alaska Peninsula and Aleutian Islands

III. Physical Characteristics

- (1) Coast region
 - (a) Islands
 - (b) Mountain chains
 1. Coast Range
 2. Saint Elias Range
 3. Aleutian Range
 4. Alaska Range
 - (c) Great peaks
- (2) Continental Alaska
 - (a) Plateau formations
 - (b) Rivers
- (3) Rocky Mountains
- (4) Arctic slope
 - (a) Plateau
 - (b) Coastal plain

IV. Climate

- (1) Dependence on surface features
- (2) Temperature and rainfall
 - (a) In coast region
 - (b) In interior
 - (c) On Arctic slope

V. Plant Life

- (1) Forests
 - (a) Forest reserves
- (2) Grasses and mosses

VI. Animal Life

- (1) Caribou
- (2) Reindeer
- (3) Marine animals

VII. Industries

- (1) Agriculture
- (2) Fisheries
 - (a) Seal fishery

- (b) Whaling
- (c) Salmon fishery
- (d) Other fish

- (3) Mining
 - (a) Gold
 1. History
 2. Output
 - (b) Coal
 - (c) Copper

VIII. Communication

- (1) Roads
- (2) Railroads
- (3) Navigable rivers
- (4) Cable and telegraph

IX. Commerce

- (1) Exports
- (2) Imports

X. Population

- (1) Density
- (2) White inhabitants
- (3) Native groups
 - (a) Aleuts
 - (b) Athapaskan
 - (c) Eskimo
 - (d) Tlinkits
- (4) Education of natives
- (5) Cities

XI. Government

- (1) Governor
- (2) Legislature
 - (a) Senate
 - (b) House of Representatives
- (3) Judiciary
- (4) Representation in Congress
- (5) Suffrage
- (6) Capital

XII. History

- (1) Discovery and exploration
- (2) Settlement
- (3) Ownership
 - (a) Russian
 - (b) Purchase by United States
- (4) Dispute over boundaries
- (5) Discovery of gold
- (6) Development of coal lands
 - (a) Fraudulent claims
 - (b) Adjustment
- (7) Cost of Alaska, and returns

Questions

What does the name Alaska mean?
 How far north do the United States mail routes extend?
 How did the United States gain possession of Alaska?

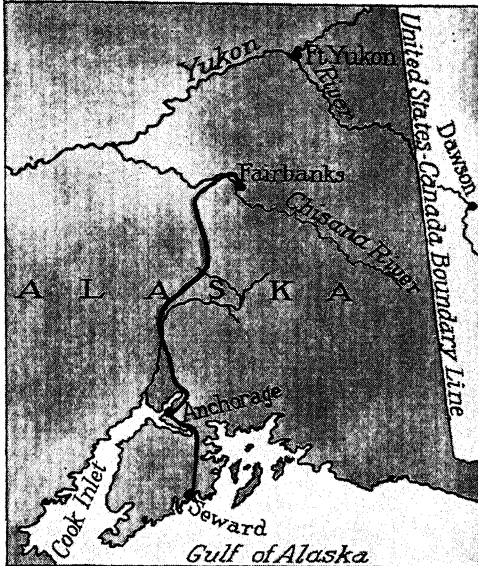
OUTLINE AND QUESTIONS ON ALASKA—Continued

Questions

- What was the general verdict regarding the transaction?
Were those responsible for it ever justified in public opinion?
Is any part of Alaska directly north of the United States?
Give a nickname commonly applied to Alaska.
What measures did the United States take to offset the damage done by unlawful seal hunters?
What animal, formerly the sole support of many of the natives, has been almost destroyed by the white man?
Has anything been done by the government to make up for the loss?
Which is the most picturesque region of Alaska?
How many glaciers is Alaska estimated to have?
How long are the longest days and the shortest nights?
Sketch briefly the amazing development in copper production.
How does the Kodiak bear compare in size with other bears?
How many miles of navigable waterway do Alaska's two great rivers furnish?
How does the Yukon rank as to size among the rivers of North America?
How does Alaska compare in size with the other territorial possessions of the United States combined?
What is the average density of population?
If all the people in the United States were transferred to Alaska, would Alaska have a population as dense as that of New York?
How large a population would Alaska have to have to be as thickly settled as Belgium?
Could it support so large a population?
How does the area of Alaska compare with the combined areas of Germany and France?
In what way does the southern coast of Alaska resemble the coast of Norway?
Where is the highest land in North America?
In whose favor was the Alaskan boundary dispute settled?
Describe briefly the largest glacier in Alaska.
What sort of vegetation clothes one-fourth of Alaska?
How much of Alaska has a distinctly Arctic climate?
Why has the southern coast region such a heavy rainfall?
Why is whaling no longer the important industry it once was?
What is a tundra?
If the United States had taken nothing from Alaska but salmon, would its purchase have been justified?
Sketch briefly the history of the gold-mining industry.
Is gold the largest annual output of Alaska?
How many government bureaus control the territory?
Who pays the expenses of the radio stations?
How many railroads on United States soil are owned by the government? Where are they?
How many Presidents have visited Alaska?
Compare the north-and-south length of Alaska with a north-to-south line in the United States.
What were mammoths?
What causes the temperate climate at Sitka?
On what Alaska island is sunshine practically unknown?
How many kinds of flowers does Explorer McMillan declare grow in Alaska?
When did Roald Amundsen visit Alaska, and under what circumstances?

was divided into claims. These claims were held either by individuals or by agents acting in the name of the claimants.

One of these agents was Clarence Cunningham, who represented thirty-three adjoining claims, probably the most valuable in the field. The Cunningham claims were all but patented when rumors of fraud were circulated.



THE RAILROAD NORTH FROM THE SEA

The line was completed in 1922. It is one of the two rail lines owned and operated by the United States government, the other being in the Panama Canal Zone.

The charges were first investigated in 1905, and in 1911 the Cunningham claims were canceled as fraudulent. In the intervening six years, the investigation had first lagged and then been pushed zealously. It led to controversy between several government officials, and finally required the attention of President Taft and Congress. The Secretary of the Interior, Richard Ballinger, had been Commissioner of the General Land Office in 1907 and 1908, and had been legal counsel for the Cunningham claimants before entering the Cabinet. A special committee of Congress exonerated Secretary Ballinger from knowledge of attempted fraud, but he resigned because he felt that his usefulness to the administration was at an end. Between 1911 and 1913, nearly three-fourths of the land claims were canceled by the government. In 1914 a new policy was inaugurated. By authority of Congress all coal lands were ordered surveyed. Parts of them were reserved for the government, and the remainder were made subject to lease to private individuals and corporations. The royalties from leases are used for development of Alaska.

Related Topics. A more detailed knowledge of the geography of Alaska may be gained from the articles on the following topics:

COAST WATERS

Arctic Ocean	Cook Inlet
Bering Sea	Pacific Ocean
Bering Strait	

ISLANDS

Admiralty	Kodiak
Aleutian	Pribilof
Bering	Unalaska

LEADING PRODUCTS

Coal	Salmon
Copper	Seal
Gold	Whale

NATIVE TRIBES

Aleuts	Eskimo
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RIVERS

Kuskokwim	Yukon
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ANIMALS

Reindeer	Seal
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SURFACE FEATURES

Glacier	Rocky Mountains
McKinley, Mount	Saint Elias Mountains

EXPLORERS

Bering, Vitus	Franklin, Sir John
Cook, James	Vancouver, George

ALBA LONGA. See **ROME** (The Period of Legend).

ALBANIA, *al bay' ne ah*, one of the youngest countries of Europe, situated in the western extremity of the Balkan Peninsula, and stretching along the southeastern shore of the Adriatic Sea, where that sea is at its narrowest. Before the Balkan Wars (which see), this region was part of Turkey. It is bounded by Greece on the south, and on the north and east by that part of Yugoslavia which formerly comprised Serbia and Montenegro. From early in 1917 to August, 1928, it was a republic; since then it has been a kingdom. Italy is regarded as sponsor and protector of this latest government.

Founding of the New State. Albania was created by a conference of ambassadors of the Great Powers which was held in London in 1912 and 1913 to settle the problems arising out of the war between the Balkan allies and Turkey. A monarchical government was provided, and the crown was accepted by Prince William of Wied, who belonged to the royal house of Rumania. Disturbances incident to the beginning of the World War led to the new ruler's abdication in 1914, and a provisional government was established under Albanian leaders. In 1917 the country was proclaimed an independent republic, under a Council of Regents, composed of a representative of each of the religious bodies of the country, subject to a Parliament of ninety-nine members. In 1920 Albania was admitted to the League of Nations.

Durazzo, most modern of its cities, on the Adriatic Sea, has about 5,000 people. Through it passes nearly all the nation's slight foreign

commerce. The largest town in the country is Scutari, in the north; it has about 32,000 inhabitants. Tirana, a few miles inland from Durazzo, has been the capital since 1925; it has 12,000 people.

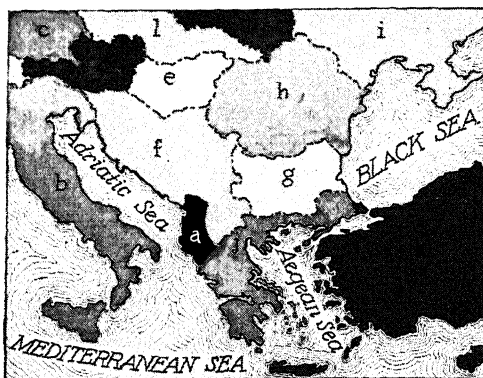
The Land and the People. This is one of the world's smallest countries; its area is about 17,000 square miles, much of it mountainous and heavily wooded, and its population is nearly 835,000. The inhabitants are poor, many are ignorant and superstitious, and their living conditions are yet primitive. Education is in a backward state, and to-day it is the nation's greatest need. The country has not yet a mile of railroad, and interior trade is by pack mules and donkeys. There are no manufactures, in the modern sense; each family provides for its own needs. The country has no banks, and no currency of its own. The government authorizes the use of any currency available, basing values upon the gold franc.

As the country until 1913 was a part of Turkey, one naturally expects the population to contain Mohammedans; the Moslem group, the Tosks, mainly in the south, comprises more than half the total number of people. The Roman Catholic Church is largely represented by the Ghegs in the north, a group frequently quarrelsome; they number about 90,000. Adherents of the Greek Orthodox Church are largely concentrated in the southern and central parts, and they number about 16,000.

Not all Albanians live in Albania; about 600,000 reside in Yugoslavia and Greece, for they were left outside the boundaries of the new state when it was organized. The language of the country is Albanian, of Indo-European origin and related to Latin and Greek, but it is characterized by several dialects.

Customs. The Albanians are the oldest original inhabitants of the Balkan Peninsula. On account of the mountainous nature of the country, they have retained their marked individuality and their ancient institutions and customs. They are the only people in Europe who have preserved to the present day the organization in tribes. The tribe is usually composed of several clans, and each clan is under a chief who is, strictly speaking, a military leader. Such cohesion in the past was the best guarantee of protection from local magistrates sent to rule over them by the oppressive Turkish government. The tribal organization even to-day regulates not only the political but also the social relations of the people. It has been preserved more fully in the mountainous regions in the north, while in the south it has been supplanted by a sort of feudal system, but slowly the people are accepting the new form of rule imposed upon them.

Industry. As stated, the country has not developed industries. Agriculture is the main dependence of the people. In the homes,



LOCATION OF ALBANIA

(a) Albania. Surrounding countries are (b) Italy; (c) Germany; (d) Austria; (e) Hungary; (f) Yugoslavia; (g) Bulgaria; (h) Rumania; (i) Ukraina; (j) Greece; (k) Turkey; (l) Czechoslovakia; (m) Poland.

sheep's wool is made into coarse native cloth, and the excess of this cloth, and wheat, tobacco, and olives not needed for home consumption are exported to neighboring countries, particularly to Italy and Greece.

History. This region, known in ancient times as Illyria, was conquered by the Romans during the second century before our era. During the Middle Ages it was invaded by various Slav peoples, who settled here. When the Turks began the conquest of the Balkan Peninsula, the Albanians fought heroically for their independence. Under their celebrated leader, George Castriot or Scanderbeg, the Albanians fought the Turks successfully from 1444 to 1456. But after his death the Turks conquered the country in 1478 and made it a Turkish province. Many Albanians then embraced Mohammedanism.

The country was almost independent from 1807 to 1822, when it was under the rule of Ali Pasha of Tepelen, surnamed the Lion of Janina, who is mentioned in Lord Byron's poems. In 1880 the Albanians tried to gain their independence, but were unsuccessful. After the Young Turks' revolution in Turkey in 1907, Albania was in continual revolt, with the aim of gaining its independence. During the first Balkan War, the people proclaimed their independence at Valona on November 18, 1912, and this was recognized by the ambassadorial conference in London in 1913. Revolutions instigated by protesting tribes are still frequent, but they have gained little headway. Since 1927 the country has been largely under the political influence of Italy, and that country was favorable to the change in the form of government by which the President was proclaimed king as Zogu I (which see).

ALBANY, GA. See GEORGIA (back of map).

ALBANY, N. Y., the capital of the state, and the county seat of Albany County, is

a city of historical interest, for it is one of the oldest in the Union. It is located on the west bank of the Hudson River, in the eastern part of the state, about midway between its north-

ing, which contains the administrative office of the University of the State of New York, including the State Library (see page 4967).

Transportation. The city has railway communication through the Boston & Albany, Delaware & Hudson, New York Central, and West Shore railways, and water connection to the interior of the state and to the north by way of the Erie and the Champlain canals. With the ocean it is connected by the Hudson River, navigable to this point by large day and night steamers. A new Port of Albany extends along both sides of the river, which provides every facility of a seaport 150 miles from the ocean. Electric and motorbus lines communicate with adjacent cities. Albany established one of the first municipal aviation fields and airports in the United States.

Commerce and Industry. The im-



Photos: U & U; Keystone

LIFE IN ALBANIA

The picturesque town of Durazzo; it is the most modern of Albanian cities. At right, the husband and wife present a view of present-day costumes, as decreed by Mohammedan rules.

ern and southern borders. New York City is 145 miles south, and Boston is 165 miles southeast. Albany is the gateway for traffic and travel between Boston and New York and the west and north. Population, 1928, 139,345.

General Description. Albany extends for several miles in a narrow plain along the river; from this ground it rises to a plateau 200 feet above tide-level, and presents an attractive appearance, with its fine buildings and beautiful parks. There are more than one hundred acres of boulevards receiving park care, the most beautiful being Manning Boulevard, in the western section, with a fine driveway and bridle paths and walks on either side, separated by lawns and stately trees. Of its eighteen parks, Washington Park is the largest. It contains a lake six acres in area, the massive King Fountain representing "Moses Smiting the Rock," and a fine statue of Robert Burns, mounted on Aberdeen granite. Van Rensselaer Manor House, erected in 1666, Schuyler Mansion, in 1760, and Ten Broeck Mansion, in 1798, are buildings of historical interest.

The most conspicuous feature of the city is the magnificent Capitol, of solid Maine granite, one of the most remarkable structures in the United States, erected at a cost of \$25,000,000; the great western staircase alone cost nearly \$2,000,000. The Military Museum, on the second floor, contains many relics of the War of Secession and the Revolution. Opposite the Capitol is the imposing State Education Build-



portance which Albany once possessed as a transfer point for traffic has been considerably lessened by through freight service, but it remains a prominent passenger center. It is a port of entry and a sub-port of entry for New York City. The leading industrial plants of the city are iron and brass works and manufactories of shirts, collars and cuffs, clothing, knit goods, and tobacco products. Albany is one of the leading cities in the making of collars.

Education. Albany has a State College for Teachers; the Albany Medical College, the Albany Law School, and the Albany College of Pharmacy, which are departments in Union University, at Schenectady; twenty-five Catholic schools of all grades; Albany Academy for Girls, Albany Academy for Boys, Saint Agnes School (Episcopal), Dudley Observatory, and Albany Institute and Historical and Art Society.

History. On the site of Albany was planted one of the oldest permanent settlements within the territory of the thirteen original states. Its historical interest is due to its strategic location during the conflict between the English and French in America and during the Revolutionary War. In 1624 some Huguenot refugees from Belgium, known as Dutch Walloons, set-

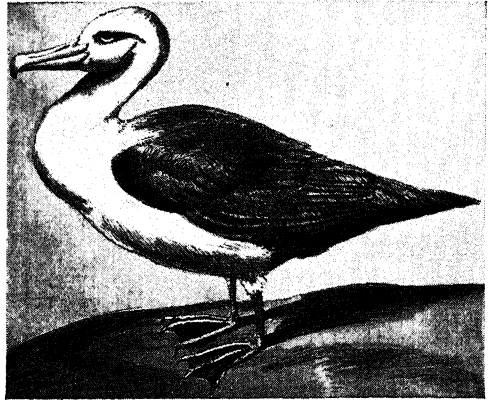
tled here, and Fort Orange was built in the same year near the spot now occupied by the Capitol. In 1630 William Van Rensselaer bought a large tract of land around this settlement and sent a party from Holland as tenants; this settlement was annexed to Fort Orange in 1652. It was first named Fuyck, meaning *hoop-net*, on account of the bend in the river where the settlement was made; later it became Beverwyck, and when New Netherlands was transferred to the English, the name was changed to Albany, in honor of the Duke of York and Albany, afterward King James II. In 1686 a city charter was granted. The most important of four Albany conventions met here in 1754 to form "a plan of a proposed union of the several colonies" (see ALBANY CONVENTION). In 1797 the city was chosen as the capital of the state. From the opening of the Erie Canal in 1825, the growth of the city was rapid, the population increasing five-fold in less than four years. Albany has several times suffered heavy losses by fires, the most disastrous being those of 1797, 1848, and 1911; in the last-named year the State Library of 500,000 volumes was destroyed. W.E.B.

ALBANY CONVENTION, a representative assembly which met at Albany, N. Y., in June, 1754, and drew up the first scheme for a political union of the American colonies. It was summoned by the British government, and was made up of delegates from Massachusetts, New Hampshire, Connecticut, Rhode Island, New York, Pennsylvania, and Maryland. After proposing a union with the Five Nations in the war with France, it drew up, at the instance of Benjamin Franklin, a plan for a government, which was to consist of a President-General, appointed by the Crown, and a Grand Council of representatives from the colonies. Though rejected by England and the colonies, the scheme was important as one of the first steps toward final union of the American colonies.

ALBATROSS, *al' ba traws*, or *al' ba trahs*, one of the largest birds of the sea. The various species are found in most parts of the ocean except the North Atlantic. The best-known species, the *wandering albatross* of the southern seas, is a bird of great beauty, nearly all white on the body, with darker tail and wings; the latter have a spread of from ten to fourteen feet from tip to tip. This bird has extraordinary powers of flight. Day after day it will follow a ship, apparently never resting, feeding on refuse thrown from the vessel and on fish that rise to the surface of the sea. Its bill is heavy and powerful, more than four inches long, and strongly curved at the tip. Like most large birds, the albatross is a greedy eater, and is readily caught with a line and hook baited with a piece of meat.

Albatrosses seek land only to breed, selecting some lonely island or desolate coast. One large

white egg is laid on the ground, no nest of any kind being made. The young bird, which is hatched in about forty days, is covered with sooty, fluffy down, and does not acquire its permanent plumage for several months. Four species of albatross are found on the Pacific



Great albatross!—the meanest birds
Spring up and flit away,
While thou must toil to gain a flight,
And spread those pinions grey;
But when they once are fairly poised,
Far o'er each chirping thing
Thou sailest wide to other lands,
E'en sleeping on the wing.

CHAS. G. LELAND—*Perseverando*.

coast of North America, but they are considerably smaller than the wandering albatross.

Sailors regard the albatross with superstitious veneration, and believe that disaster follows its wanton destruction. This belief is the basis of Coleridge's poem, *The Ancient Mariner*. See ANCIENT MARINER, where there is a color plate. See, also, FRIGATE BIRD. D.L.

Scientific Name. Albatrosses belong to the family *Diomedidae*. The wandering albatross is *Diomedea exulans*.

ALBEDO, *al be' doh*. See VENUS; MERCURY.

ALBEMARLE, *al' be marl*, **SOUND**, a great bay in the northeast lowlands of North Carolina, extending from the mouths of the Chowan and the Roanoke rivers eastward to the Atlantic Ocean, from which it is separated by a long island. Its length is about fifty-five miles, and its width from four to fifteen miles. The water is shallow and nearly fresh, and the sound is not greatly affected by the ocean tides.

ALBERT, FRANCIS CHARLES AUGUSTUS EMANUEL (1819-1861), the husband of Queen Victoria of Great Britain, known popularly as the *Prince Consort*. His rank of nobility was Prince of Saxe-Coburg-Gotha. He was born near Coburg, in Germany, and was educated under private tutors and at the University of Bonn. In 1840 he was married to Queen Victoria; she survived him forty years. See

VICTORIA, in which article appear the names of their children.

ALBERT, PRINCE OF MONACO. See MONACO (A Prince Who Was a Scientist).

ALBERT I (1875-), king of the Belgians since 1909, one of the most heroic figures of the early years of the twentieth century. At the end of July, 1914, King Albert was ruling in peace over a prosperous, peaceful nation; two months later he was still king of the Belgians, but almost the whole of his country was in the hands of invaders, and he, with the remnant of the Belgian army, was defending the last corner of Belgium over which the Belgian flag still waved. The World War made Albert the idol of his people. He personally commanded the Belgian army, resisted the German advance at every point, and, although repeatedly urged not to expose himself to the hardships and dangers faced by his soldiers, refused to yield the active leadership to others.

King Albert was born on April 8, 1875. He was the son of Philip, Count of Flanders,



Photo: U & U

KING ALBERT OF BELGIUM

younger brother of King Leopold II, and the grandson of King Leopold I, the German prince who was elected king of the Belgians in 1831. He is a second cousin of King George V of Great Britain and Ireland and of former William II of Germany, and distantly related to former King Ferdinand I of Bulgaria. At the death of King Leopold II, on December 17, 1909, Albert became king, because Leopold left no sons, and his three daughters were excluded from succession by the Salic law.

As a boy Albert was carefully educated, and later made a special study of economics and social science. He traveled extensively, made a study of railways in the United States under the guidance of James J. Hill, and studied conditions in the Belgian Congo at first hand. Long before he became king, his liberal and democratic inclinations were well known, and since his ascent to power they have frequently shown themselves.

King Albert's private life, unlike that of his predecessor on the throne, has been above reproach. On October 2, 1900, he married Princess Elizabeth of Bavaria, who was conspicuous at the outbreak of the World War for her courage and her loyalty to her adopted country. Their eldest child and the heir to the throne is Prince Leopold, born in 1901. There are two other children, Prince Charles, born in 1903, and Princess Marie-José, born in 1906; she was married in 1930 to Crown Prince Humbert of Italy.



ALBERTA, one of the nine provinces of the Dominion of Canada. Like all of the great Canadian Northwest, it was for 200 years, from 1670 to 1870, a part of Rupert's Land, the domain of the Hudson's Bay Company. Not until 1882 was the name Alberta given to any part of Canada. The original district of Alberta, as shown on the map on page 184, comprised less than half of the present province. In 1905 the provinces of Alberta and Saskatchewan were erected from the area included in the four districts of Alberta, Assiniboia, Athabaska, and Saskatchewan.

Area and Population. The area of the province is 255,285 square miles, which is about 3,500 square miles larger than Saskatchewan or Manitoba. Alberta is nearly 50,000 square miles larger than either France or Germany, and has more than double the area of the

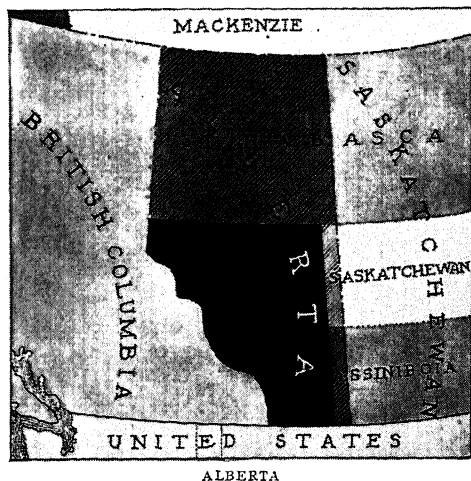
British Isles. Of the states of the Union, only Texas, with 265,896 square miles, is larger. This vast province of Alberta is still sparsely populated. In 1901 it had only 73,000 inhabitants, but in 1905, when it became a province, the population was doubled. In the following decade the steady stream of immigration continued until the outbreak of the World War in 1914. Population of the province, 1926, 697,599.

Of the total number of people, about one-fourth are of English birth or descent. Another fourth include Scotch, Irish, and other British. The remaining half include Germans, Austrians, Scandinavians, French, and many other nationalities and their descendants. The American-born population totals about 100,000.

The urban, or town, population is growing rapidly; about forty per cent of the total is

now found in cities or towns. The largest city is Calgary; Edmonton, the provincial capital, is next in size. Lethbridge and Medicine Hat rank next.

Physical Characteristics. The western boundary, for part of its length, is the main divide of the Rocky Mountains, whose snowy peaks are Western Alberta's distinctive feature.



Part in solid black is the former district of Alberta; part shaded in diagonal lines shows portions of other districts added to original Alberta to form the present province.

Many of them have altitudes of 10,000 feet or more, and a few of the peaks exceed 12,000 feet, notably Mount Columbia and Mount Alberta. Mount Assiniboine, a famous peak, reaches 11,830 feet. On clear days the mountains are visible from the plains 100 miles to the east. No more beautiful scenery is found in Canada than around Lake Louise.

The eastern slope of the Rocky Mountains is very gradual, and many foothills soften the outlines of the peaks. East of the mountains and their foothills, Alberta is a part of the Great Central Plain of North America. As far as the eye can see, in every direction, are undulating prairies, with here and there a low, treeless ridge. The rainfall is not abundant, and the moisture is quickly evaporated by the warm, dry winds from the west. By reason of its mild winter climate and naturally cured grasses, this area was formerly devoted to ranching, but by special methods suited to the conditions, the whole of the country is being brought under cultivation. Irrigation is practiced on lands tributary to Calgary, Lethbridge, and Medicine Hat; there is sufficient water supply to irrigate about 2,500,000 acres of Southern Alberta.

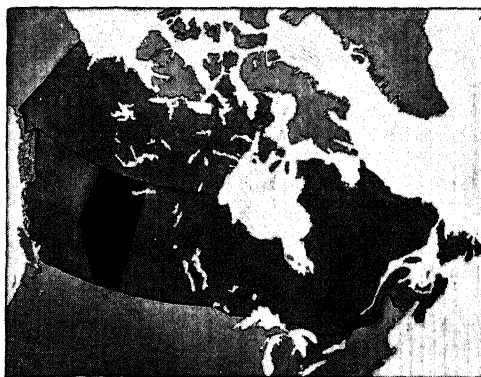
In the central and northern parts of the province the rainfall is slightly heavier and the evaporation less rapid than in the south. Vegetation, too, is heavier and more varied.

Pleasure Grounds. Alberta possesses beautiful national and state parks; these attract visitors from the United States as well as from all parts of Canada. Prominent among them are Rocky Mountains Park, Buffalo Park, and Jasper National Park. Wondrous Lake Louise is in Rocky Mountains Park.

Climate. As Alberta is 750 miles long from north to south, and has a maximum width more than half as great, considerable variations in climate are not astonishing. From the northern to the southern boundary is as far as from New York City to Charleston, S.C., and is almost as far as from San Francisco to Portland, Ore.

The province may be divided into three climatic parts, each about 250 miles long from north to south, and each having a characteristic climate. The southern third has a moderate, changeable climate, with an average winter temperature of 14° to 16° F. This is perhaps four or five degrees lower than the mean winter temperature for Northern Illinois. The central section, of which Edmonton may be taken as a center, has an average annual temperature about the same as that of Minneapolis. The mean winter temperature at Edmonton is about 10° F. The northern third has a severe climate, with the temperature hovering around zero during most of the winter. This region is usually called sub-arctic, but its low altitude, only 600 feet above sea level, gives it an average summer temperature less than two degrees lower than that of Edmonton and Calgary.

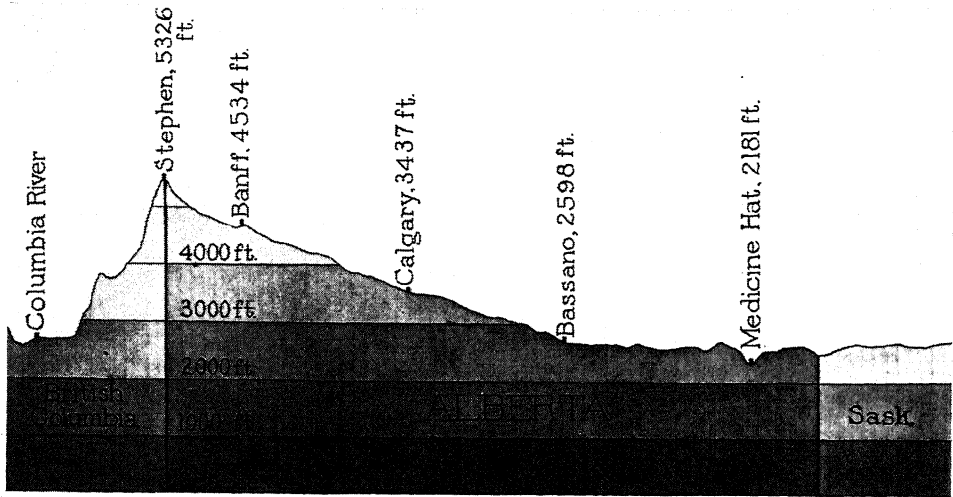
While the climate of Alberta, in common



LOCATION MAP

Size of Alberta, as compared with the area of the entire Dominion of Canada.

with that of the other prairie provinces, is usually said to be extreme, the inner slope of the Rocky Mountains is affected by warm western winds along its whole length. The effect is not so great in Central or Northern Alberta as it is under the strong Chinooks of Southern Alberta, but it is sufficient to make cultivation possible far north in the valley of



ELEVATION OF ALBERTA

Lowest point shown is at Medicine Hat, 2,181 feet above sea level. The elevation shown is on the line of the Canadian Pacific Railway, where on the western boundary the climb is to 5,326 feet.

Peace River, and this area is being rapidly settled.

Drainage. There are three great river systems represented in the drainage of the province. In the extreme south is the Milk River, a tributary of the Missouri-Mississippi system. With this exception, the entire drainage may be divided into two parts, the Saskatchewan and the Mackenzie systems, both of which have their origin on the Alberta slope of the Rocky Mountains. Between these two systems is a height of land, or watershed, running in a northeasterly direction. South of the watershed the land slopes gradually to the east, and is drained by the two branches and numerous tributaries of the Saskatchewan. North of Edmonton the slope is more to the north, and here the waters are carried away by the Athabaska and Peace rivers, the great tributaries of the Mackenzie.

There are numerous small lakes; the largest of these are Lesser Slave Lake, with an area of 480 square miles, and Lake Athabaska, of whose total area of 2,842 square miles about one-third is in Alberta and the remainder in Saskatchewan.

Natural Resources. Out of a total acreage of 163,384,000 acres, it is estimated that 60,000,000 acres in Alberta are suitable for cultivation. About one-fifth of this area has been brought under successful cultivation, and there still remain available for settlement 15,000,000 acres of surveyed land. The best soil is found in the central section, and consists largely of black vegetable mould. But recent surveys of the Peace River District in Northern Alberta have opened up a vast territory for agricultural development, and in spite of its northerly loca-

tion, it is expected that this district will become in time one of the most prosperous grain-growing belts in Alberta.

Animal Life. In the mountains and woods are grizzly, black, and brown bears, and the coyote's howl is familiar almost everywhere. Because many of their haunts are inaccessible to man, mountain sheep and goats are still numerous, and elk, antelope, and red deer are common, and even the lordly moose, monarch of the forests, is frequently seen. Among other animals are the lynx, mountain lion, porcupine, squirrel, and rabbit.

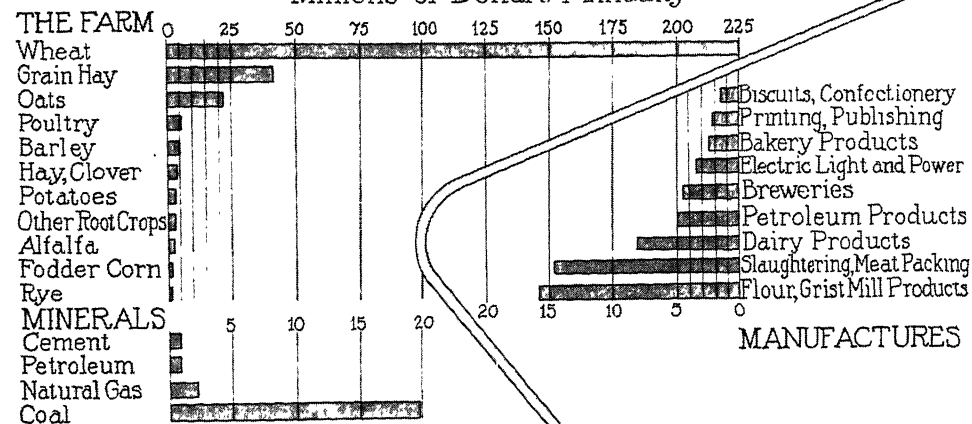
Farther to the north, the fur hunter still follows the traditional occupation of the north-land, and ermine, otter, beaver, mink, and marten reward his labors. The north is also the home of the musk ox, and is the nesting ground for ducks, geese, swans, and other migratory birds. The lakes and rivers are well stocked with fish, pike, pickerel, and whitefish being most abundant.

A policy of strict conservation is being followed with respect to the desirable wild life of the province. Five parks are administered by the Dominion Commissioner of Parks, and in these the animal and plant life is fully protected. Rocky Mountains Park and Jasper Park are great national resorts as well as game and forest preserves. At Buffalo Park and Elk Island Park, at Wainwright, a herd of prairie buffalo and a considerable number of moose, elk, deer, and antelope are held.

Mineral Wealth. *Coal.* This is by far the most important of the minerals in Alberta, containing as it does fifteen per cent of the coal reserves of the world and eighty-seven per cent of the coal reserves of Canada. The

ALBERTA PRODUCTS CHART

Millions of Dollars Annually



Figures represent averages for three years.

known reserves cover an area of over 25,000 square miles, and are over 386 billion metric tons. The probable reserves are over twice as great.

Petroleum. Almost universal interest has been focused upon the oil fields of Northern Alberta. There are 15,000 square miles centered around Fort McMurray, on the Athabaska River, underlaid by bituminous sands which geologists believe to comprise one of the greatest potential oil fields in the world. A great deal of capital has been expended on this territory, and while the output at present does not seem to justify the expenditure, the results are yearly proving more satisfactory. Turner Valley is the principal source of production, with more than a dozen wells now under operation. The wells in this field give a wet gas, from which a high grade of crude naphtha is separated. Natural gas is found in large quantities in four distinct areas—Medicine Hat, Bow Island, Okotoks, and Viking. Production now exceeds 7,000,000,000 cubic feet annually. Gypsum is found in large quantities and under favorable mining conditions in the Peace River district, and in the environment of Edmonton. Salt occurs in Northern Alberta, near the Mackenzie, Slave, and Athabaska Rivers. Large quantities of rock salt are found near Fort McMurray, while Glauber salts and other commercial salts are found near Fusilier and Wainwright.

Farming and Ranching. In the early days of Alberta's history, ranching held undisputed sway, and it is still one of the leading industries of the province, although it has ceded first place to grain and mixed farming. The territory became famous for its vast ranches and its beef cattle. Most of these large ranches have been absorbed by grain farms, but Southern

Alberta still boasts a number of large ranches, among which is the Royal Ranch owned by the Prince of Wales and situated twenty-five miles west of High River. In 1927 the total number of livestock in the province comprised 726,600 horses, 1,535,000 cattle, 510,000 sheep, and 742,600 swine, at a total estimated value of approximately \$100,000,000. This is several millions under the estimate for 1922 and 1923, which seems to indicate that the livestock industry is on the decline in Alberta, even though in 1911 the number of beef cattle was 592,163, and in 1926 it was 929,111.

Dairy farming continues to hold its own, the total value of dairy products having been estimated at \$20,750,000 in 1927, with poultry products estimated at \$8,500,000. In 1911 there were 147,687 milk cows in the province, while in 1926 there were 436,505.

But the development of grain farming has been phenomenal in Alberta. In 1905, the first year of Alberta's provincial life, there were 616,821 acres under cultivation, with a total yield of 34,091,429 bushels. In 1928 about 11,000,000 acres were under cultivation, with a total yield of 288,254,000 bushels.

The value of all field crops in 1905 was estimated at \$20,000,000, while the estimated value for 1928 was \$222,590,000.

Irrigation. There are a number of irrigation projects under way in Southern Alberta. The Canadian Pacific Railway projects, known as the Eastern, Western, and Lethbridge projects, are by far the most important of these enterprises, but there are in all about 700 privately owned projects within the provinces of Alberta and Saskatchewan. The territory which had been irrigated up to 1928 comprised about 427,300 acres, and the crops produced on this area are valued at over \$9,000,000. The main

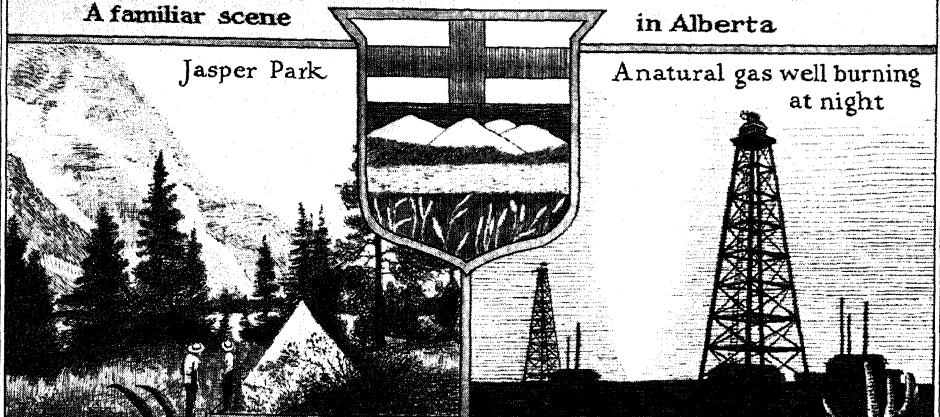


A familiar scene

in Alberta

Jasper Park

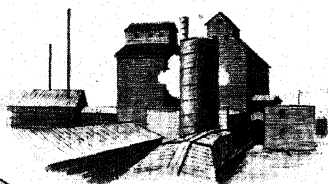
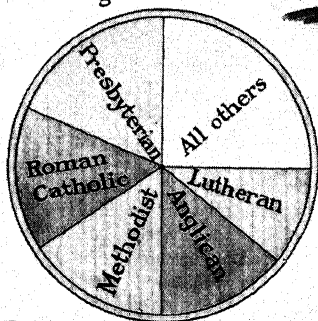
A natural gas well burning at night



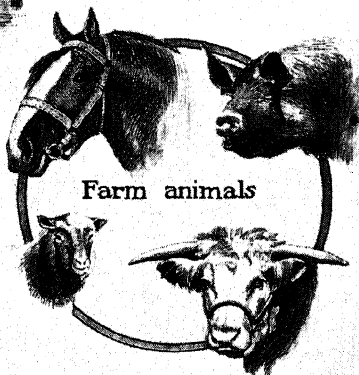
ALBERTA

Rocky Mountain
white goat

Moose

Where the grain
is stored

Religions



Farm animals



Parliament building, Edmonton

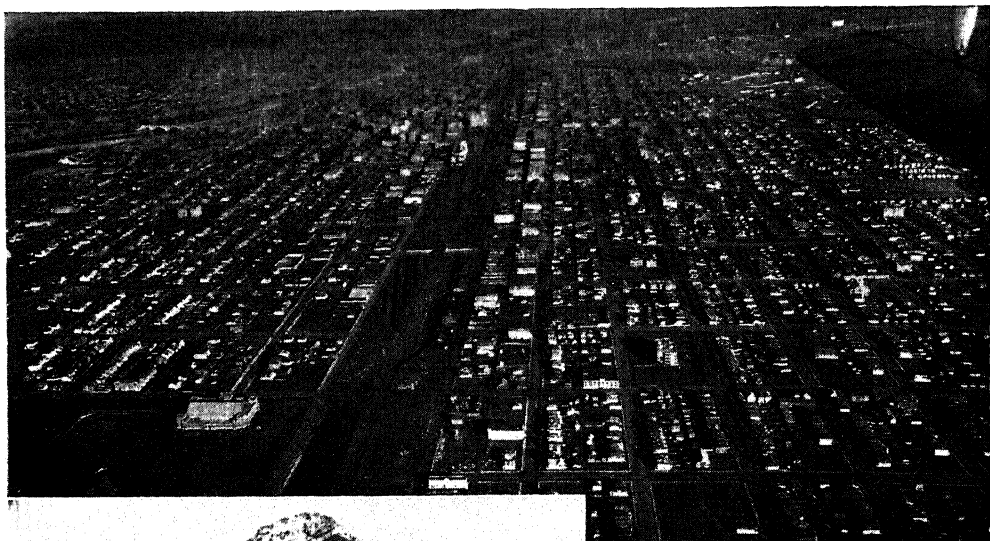


Photo above: Canadian Air Force

IN ALBERTA

The city with its straight streets and flat surface is Calgary. At the left is Crow's Nest Mountain, one of the beautiful spots in the province, near Coleman.



caught in the waters of Northern Alberta averaging about \$400,000. Whitefish, pike, and pickerel are most numerous.

Lumbering. Lumbering has not been developed to a great degree in Alberta. Alberta has an area of

crops are hay and alfalfa, though sugar beets are becoming an important crop as the result of the sugar refinery recently erected in the heart of this district. About 267,780 acres are irrigated by the various projects, and there is a steady development of interest in enterprises of this kind, both by various corporations and individuals and by the provincial government. The Bow, Old Man, and Belly rivers are being utilized largely for irrigation purposes, and the territory between Calgary and Medicine Hat and Lethbridge is the main area within the bounds of these projects.

Mining. Alberta usually ranks fourth in the Dominion of Canada in the production of minerals; its output is not far from \$30,000,000. This is almost eight times the value of its mineral output in 1905. Coal is the most important mineral, with an average yearly production of 7,000,000 tons. Alberta leads the Canadian provinces in the production of petroleum. In 1927 Alberta produced 321,154 barrels, or more than three-fifths of the total output for the Dominion. Lead and silver are mined in small quantities, and there is a very small quantity of gold mined in the province.

Fishing. Fishing is a minor industry of Alberta, the total annual value of the fish

60,000 square miles of merchantable timber, and there are about 12,000,000 acres of forest reserves. Pulp-wood material available is estimated at 270,000,000 cords. With the development of railways in the north of the province, lumbering will become an important industry.

Water Power. As yet, water-power development has not received much attention. There is available 1,049,500 horse power in the province, but the actual turbine installation is as yet only about 36,000 horse power.

Manufacturing is steadily growing in importance; there are in existence about 750 manufacturing plants, with a capital of \$70,000,000, and a combined production value of \$75,000,000. About 10,000 persons are engaged in the manufacturing industry in Alberta. Flour, meat, butter, cheese, bread, petroleum, and electric-light products are the most important manufactures. Building and construction received a new impetus in 1927, and a number of important projects were then under construction, among which was a million-dollar departmental store in Calgary, which has been constructed by the T. Eaton Company.

Means of Travel and Communication. Lack of railway communication left the Northwest



Photo: Canadian Air Force

AIRPLANE VIEW OF EDMONTON

Territories for many years with the characteristics of a frontier community. In 1871, when British Columbia became a part of the Dominion, one of the conditions on which it insisted before joining was the construction of a transcontinental railway. This railway, the Canadian Pacific, was completed in 1885, thus giving Alberta rail connection with the rest of the Dominion. In the following twenty years there was little additional construction. In 1905, when Alberta became a province, the Canadian Pacific was still the only railway; besides the main line there were two important branches, linking Calgary with Edmonton and Macleod. There are now three great transcontinental railways crossing the province and radiating to all important towns. Two of these belong to the Canadian National system. The province has a ratio of one telephone to every eleven or twelve of population. Only in the United States is the telephone as much used. The telephone system is owned and operated by the provincial government.

Government. The government of Alberta, like that of Saskatchewan, was organized by authority of the Dominion Parliament in 1905. The formal inauguration of provincial government took place on September 1, in the presence of Earl Grey, then Governor-General, and Sir Wilfrid Laurier, Premier of the Dominion.

The Legislature. Alberta is now represented in the Dominion Parliament by four Senators, and in accordance with the census of 1921, is entitled to sixteen members in the House of Commons. The legislative powers of the prov-

ince are exercised by an assembly of sixty-one members, whose enactments require the approval of the Lieutenant-Governor, who is the chief executive.

Local Government. The general superintendence of local government is in the hands of the Minister of Municipal Affairs, a member of the Executive Council of the province. Rural communities and towns are governed under provincial acts. The rural municipality has a council, including a reeve and five councillors, and a town has a mayor and six councillors. The affairs of incorporated cities are regulated by special charters.

Education. The unit of education in Alberta is the school district, and there are over 3,300 of these. The district is usually about four square miles, and may be organized as soon as it has four taxpayers and eight children of school age. The local school boards, elected by the voters, are under the general direction of the provincial Department of Education. The schools are supported partly by local taxation and partly by grants from the government.

Leading the public-school system, the provincial University of Alberta was established at Edmonton in 1910. Affiliated with it are Alberta College (Methodist) and Robertson College (Presbyterian). The other institutions for higher education are numerous and excellent, and include the Provincial Institute of Technology at Calgary, the Lutheran College at Camrose, Mount Royal College (Methodist) and Western Canada College, both at Calgary. Normal schools are located in Calgary, Edmonton, and Camrose.

History. As told above, the name Alberta was given to a district of the Northwest Territories in 1882. Calgary was founded in the next year, and the completion of the Canadian Pacific Railway in 1885 gave a new impulse to settlement. As other communities soon dotted the plains, a demand arose for self-government, but not until 1905 was this demand granted by an act of the Dominion Parliament creating the provinces of Alberta and Saskatchewan. The first legislature met in 1906 at Edmonton, which was fixed as the capital. The year 1909 marked the completion of the Grand Trunk Pacific Railway from Winnipeg to Edmonton, (now a part of the Canadian National system), and also the purchase by the government of all the telephone lines in the province.

A startling development in 1913 and 1914 was the great oil "boom" in the Calgary district. Oil of excellent quality was first discovered in the Dingman Well at Okotoks in October, 1913, and in the next year other wells were bored. The suddenness of the discovery was equaled by the enthusiasm of investors and promoters.

Much speculation followed, and of about 400 companies organized, most of them failed, with consequent loss to investors. The undoubted fact, however, is the presence of petroleum of good grade, and in time the field should be of great commercial importance.

In 1915 the people of Alberta were called on to decide whether or not the province should have prohibition. By a vote of 50,000 to 30,000 the voters decided for prohibition, and on June 30, 1916, every hotel bar in the province closed its doors. The success of the measure was not considered outstanding, however, and in 1923 another referendum was taken which resulted in the repeal of the Prohibition Act and the adoption of government control and sale of all liquors for beverage and medicinal purposes. Later the law was modified, and the sale of liquors is now conducted through government vendors under strict regulations. In 1916 an act of the legislature placed women on an absolute equality with men with respect to political rights.

Conspicuous among the developments of most recent years has been the growth of the coöperative movement in agriculture and the choice of the Pacific and Panama route for farm products destined for European ports.

From Alberta's inception as a province until 1918 there were but twenty divorces granted, but in that year the Privy Council in London gave to the Alberta courts the right to grant divorce decrees, and since that date there have been nearly a thousand divorces granted, 148 having been granted in one year alone.

Related Subjects. The following articles contain much detailed information which will supplement the general material given above:

CITIES AND TOWNS

Banff	Edmonton
Calgary	Medicine Hat

HISTORY

Assiniboia	Royal Canadian
Athabaska	Mounted Police
Hudson's Bay Company	Rupert's Land



Photo: Herbert

THE "PUNCH BOWL"

Framed in a rocky orifice, the famous Punch Bowl Falls, in Jasper National Park, presents a real moving picture. The rock formation is the result of erosion through the ages.

LAKES

Athabaska	Lesser Slave	Louise
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MOUNTAINS

Assiniboine	Columbia
Athabaska	Hooker
	Rocky Mountains

PRODUCTS

Cattle	Fur	Petroleum
Coal	Horses	Wheat

RIVERS

Athabaska	Peace	Saskatchewan
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UNCLASSIFIED

Chinook	Parks, National
Irrigation	Rocky Mountains Park

QUESTIONS ON ALBERTA

(An Outline suitable for Alberta will be found with the article "Province.")

What are the pleasure grounds of Alberta?

Name some of the great mountain peaks.

What was the percentage of increase in population between 1901 and 1911?

How many Canadian provinces are larger than Alberta? How many states of the United States?

If all the inhabitants of Canada were transferred to Alberta, would the density of population be greater or less than that of the United States?

How large is Rocky Mountains Park?

Of what large reservation is Lake Louise a part?

Does the larger part of Alberta's population live in towns or in the country?

Give statistics to show the marvelous growth of Alberta's largest city.

How many provinces have fewer people to the square mile than Alberta? How many states of the United States?

What part of Alberta can well be called the "Switzerland of America"? Why?

Which is the largest lake in the province? Which is the most beautiful?

How many acres are suitable for cultivation?

How does the amount of wheat raised in Alberta compare with that raised in Iowa?

Compare, as to value, the coal production with its production of wheat; its lumber with its slaughtering industry.

What is the greatest irrigation project in Alberta?

What percentage of increase has there been in railway mileage since Alberta became a province?

How do Alberta's facilities for telephone communication rank with those of the other provinces? With those of other countries?

In which direction does the watershed run?

About how many acres of cultivable land has Alberta?

What have been the results of irrigation?

ALBERTA, MOUNT. See **CANADA** (Physical Characteristics: The Mountains).

ALBERTA COLLEGE. See **ALBERTA** (Education).

ALBERT EDWARD NYANZA, the former name of Lake Edward. See **EDWARD, LAKE**.

ALBERT KAHN FOUNDATION. See **EDUCATIONAL FOUNDATIONS**.

ALBERT NYANZA, OR ALBERT LAKE (*Nyanza* means *lake*), lies in Central Africa, about 2,400 feet above sea level, and is 100 miles long and twenty miles wide. It is connected with Lake Edward, once known as Albert Edward Nyanza, by the Semliki River and with the Victoria Nyanza by the Victoria Nile. Here are found in great numbers the crocodile and hippopotamus. It was discovered in 1864 by Sir S. Baker, and named after Albert, consort of Queen Victoria. See **EDWARD, LAKE**; **AFRICA** (Lakes).

ALBERTUS MAGNUS. See **ALCHEMY**.

ALBINO, *al by' no*, a human being or other animal whose skin, hair, and eyes show radical difference from the normal because of the absence of pigment, that is, dark coloring mat-

ter. The condition may be inherited. A human being who is a complete albino has pale, milky-white skin, white hair, and pinkish eyeballs. The latter condition is due to the fact that the red blood of the capillaries shows through the transparent cornea, iris, and retina (see **EYE**); in normal beings it is concealed by the coloring. Also in normal eyeballs the coloring matter diminishes the intensity of the light which falls on the retina, but an albino is not thus favored and must keep his eyes nearly closed in the sunlight.

Albinism may be partial or complete, and though prevalent among Indians and negroes, may occur in any race. Among the lower animals, white mice, white rabbits, and white poultry are examples of albinism that is fixed by heredity. This condition is often noticed in the flowers of plants.

It is popularly supposed that an albino is weaker in constitution than a normal being, but experiments have failed to show positive proof of this. See **HEREDITY**. C.W.

ALBION. See **CHALK**; **ENGLAND**.

ALBITE, *al' bile*. See **FELDSPAR**.

AL-BORAK. See MOHAMMED, subhead.

ALBUQUERQUE, *al bu kur'ke*, N. M. See NEW MEXICO (back of map).

ALBUMEN, OR **ALBUMIN,** *al bu' min*, a substance which has its best-known form in the white of an egg (see EGG). Scientists usually make a distinction between the two spellings, *albumen* being actually the white of an egg, and *albumin*, the general term for the chemical compound. It is also customary to use the term *oxalbumin* for the albumin in the white of eggs; *lactalbumin* for that in milk; *serum albumin* for that in blood. All albumins are compounds of carbon, hydrogen, nitrogen, and oxygen, with a little sulphur. Albumin is typical of the class of foods called *proteins* (which see).

Its Uses. When heated, albumin hardens and finally becomes a solid mass. If it is mixed with water and then heated, it either settles to the bottom or forms a scum at the top, which can easily be removed; in this process it takes up any substances which may be suspended in the liquid. For this reason many cooks drop an egg into coffee to "settle" it. Albumin is used in sugar refining, and to some extent in other industries, and its use is spreading.

Albumin hardens not only when it is heated, but also when exposed to certain salts, practically all of which are poisonous. Thus, corrosive sublimate, or bichloride of mercury, turns the white of an egg to a solid. If no other remedy is at hand, the white of an egg is the best antidote for many cases of poisoning, as the albumen surrounds the poison with a solid coating which nothing in the digestive system can dissolve. T.B.J.

ALBURNUM, another name for *sapwood*. Accordingly, it includes, in our hardwood and other trees, the younger wood layers or rings, that is, those immediately beneath the bark and growing layer, the latter being the *cam-bium*. The alburnum is usually distinguished from the deeper layers of *heartwood* by its lighter color. Ordinarily, a new ring of alburnum is laid down each growing season, but since the older rings are gradually changing over or hardening into heartwood, it may not appreciably increase in extent.

The age of trees may be judged approximately by the number of wood rings shown when the tree is felled. In some of California's giant sequoias, over 2,000 wood rings have been counted, proving their existence at a time prior to the birth of Christ. B.M.D.

Related Subjects. In the article TREE the reader will find a diagram showing the rings of annual growth. See, also, SAP; SEQUOIA.

ALCESTIS, *al ses' tis*, in Greek mythology, the wife of Admetus, king of Thessaly, and one of the most attractive characters which have been handed down by legend. An oracle

had declared that her husband, whom she loved devotedly, was to die unless someone could be found who would meet Death in his place. His aged father and mother were asked to sacrifice themselves for him, but they refused, and Alcestis finally took upon herself the task of saving him. He pleaded with her not to insist upon her unselfish act, but she was firm, and as Admetus recovered, Alcestis died. Hercules, however, having pity upon Admetus, met Death at the tomb, vanquished him, and brought Alcestis back to life. The *Alcestis* of Euripides is one of the greatest of the ancient dramas which have been preserved. Browning's *Balaustion's Adventure* is a free translation of it.

ALCHEMY, *al' ke mie*, a so-called science of the ancients, which arose with the beginning of speculation as to the constitution of matter and the visible universe. Its roots go back to the ideas underlying primitive magic and the earliest philosophies. Its search was for the elements and elemental forces from which the earth, and all upon it, were formed; it investigated the processes of change to which matter could be subjected, by fire, by solution, by evaporation, by condensation. Such inquiry led to the discovery of what are now familiar chemical and physical reactions.

Following the clue of human affairs, alchemy assigned value and dignity and virtues and a scale of relation to the several elements; it developed a system of affinities and correspondences between the metals, the stars, the functions of the body, and the forces that sustain life. Each part of the body was related to some one element (metal) and some one planet. The ingredients of medicines, the time of taking them, were alchemistically related to the part affected. The application to medicine led to the study of the curative virtues of things.

At the height of its career, alchemy was almost encyclopedic in scope. The Arabs spoke of it as the key that unlocked the mysteries of creation; a more elaborate notion appears in "the philosopher's stone," the discovery of which would enable one to penetrate the reactions of matter, or in such fulfillment of wishes as the "elixir of life," the "fountain of youth," or the panacea for all ills. Alchemy aimed to be science and art in one.

As the practical motive dominated, alchemy became largely a search for the transmutation of the metals, particularly of the baser metals, into gold; for to gold by its attraction and its associated value was assigned the virtue of purity and superiority. In this pursuit there was abundant opportunity for fraud and imposture as well as for misguided experiment and self-delusion; these pursuits gave rise to the accusation of necromancy against many of the alchemists. This was true of Paracelsus

(1490-1541), one of the best known of the later practitioners, who made substantial contributions to chemistry and medicine, yet worked dominantly under alchemistic conceptions; he gave special prominence to sulphur and mercury as potent in transformation and medicinal action. Even so late as the end of the eighteenth century, Cagliostro—an arch-impostor—played upon the belief in the possibility of making gold, to practice his versatile frauds, and presented his wife, who was twenty, as a woman of sixty who had partaken of the elixir of life.

Alchemy is much more than the search for a process of transmutation to turn baser metals into gold; that became the central aim of its later pursuit. An alchemistic philosophy underlay its practices. The Greeks recognized earth, air, fire, and water as the four elements; these interacted and were responsible for the many forms of matter, including the human body. Hippocrates, the "father of medicine," thought that if the human body were formed of but one element, man would never be ill. He is composed of many elements which conflict; hence the complexity of medical treatment, balancing the dry and light (fire), the dry and heavy (earth), the moist and light (air), and the moist and heavy (water). The four elements and the four humors of the body were closely related. Yet the Greeks were not alchemists, but sought explanations in natural terms. However, they reasoned similarly to the alchemists, who sought explanations in mystic bonds. The latter dealt in analogies and correspondences. The celestial world gave the clue to the things of earth. The sun represented heat or fire or sulphur, and then gold; the moon corresponded to silver; to complete the system, Venus corresponded to copper; Mercury is still the name of a planet and a metal; Mars "became" iron; Jupiter, tin, and Saturn, lead. The alchemistic search was originally like that of the Greeks, for the quintessence (fifth or ultimate essence) of things; the alchemists wished to repeat in their alembics (stills) the process by which the world was made. Two other ideas accompanied this search; one of them was concerned with the healing of the body, for disease was a disproportion of the elements (hence the preparation of tinctures, extracts, "spirits," elixirs to restore health); the other was the rather mystical notion of separating the spirit from the form, the true essence from the material shell.

More and more the "chemical" side dominated through the notion of transmutation, presumably introduced by Albertus Magnus (1193-1280). This implied a scale of evolution or value through which matter passed on its way to its more perfect form. The perfection of the heavenly bodies, of gold, of true health (immortality), moral perfection—purity of ele-

ments and purity of spirit—were assimilated, and affinities in one world found for substances and qualities in another. Such learning was maintained in an atmosphere of secrecy and mystery. Alchemy became more cumbersome, elaborate, and fanciful, while the temptation to pretense and fraud increased as the test of the system was concentrated upon the making of gold. At the beginning of the seventeenth century, already markedly on the decline, it gave way to the growth of modern science, which was then well launched upon its career of natural explanation and proof.

It is a most interesting fact that the old quest for transmuting the elements has been revived, and is being carried on by chemists working on a scientific basis. Radioactivity (which see) is a natural process whereby one element is changed into another. Men are now endeavoring to imitate this process. Individual successes have been reported, but the amount of matter transmuted is on so minute a scale that the experiments so far are merely of theoretical value. See CHEMISTRY (Transmutation of Elements). J.J.

Relating to Various Beliefs. The articles on the following topics are of interest in this connection because they also deal with pseudo-sciences or superstitions:

Astrology	Occult
Clairvoyance	Palmistry
Conjuring	Phrenology
Demonology	Physiognomy
Divination	Psychical Research
Ectoplasm	Psychoanalysis
Faith Cure	Science and the Sciences
Hypnotism	Spiritualism
Magic	Suggestion
Medium	Superstition
Mesmerism	Telepathy
Mind Reading	Trance
Necromancy	Witchcraft

Other closely related topics are mentioned in the foregoing article, and will be found in their alphabetical order in these volumes.

ALCIBIADES, *al si bi' a deez* (about 450-404 B.C.), a famous Athenian of noble birth, a nephew of Pericles, handsome in person and of remarkable ability, who for many years bore a leading part in the affairs of Athens. In his youth he was lawless and impulsive, and not even the influence of his good teacher, Socrates, could turn him from dissipation.

Alcibiades rose rapidly in political power and set himself up against Nicias as leader of the war party. He took an active part in the Peloponnesian War, which began in 431 B.C., and when Nicias was defeated in Thrace in 418-417 B.C., he strongly urged that an attack be made on Sicily. Alcibiades was chosen one of the leaders of this expedition, but just before it sailed he was accused of mutilating the busts of Hermes in one of his midnight revels, and was recalled home for trial almost as soon as he reached Sicily. Fearing to face this ordeal, he escaped to Sparta. His ostracism from Athens was voted.

In Sparta he basely betrayed the secrets of his own countrymen, and by advising the Spartans to send help to the people of Syracuse and to fortify Decelea, in Attica, he became the direct cause of the downfall of Athens. The Spartan generals soon turned against him, and, fleeing to Asia Minor, he allied himself with the Persian leader Tissaphernes.

Determined to return to Athens, at length he succeeded in having his banishment canceled. Before he arrived home, he took charge of the Athenian fleet near the Hellespont, and won several victories over the Spartans. The Athenians joyfully welcomed him home in 407 B.C., and made him a general with full powers, but he soon lost their favor by reason of a defeat at Notium. In 405 B.C. came the final crushing defeat of Athens at Aegospotami, and Alcibiades took refuge in Asia Minor, hoping to secure the aid of the Persian king against Sparta. There he was assassinated.

Related Subjects. The reader is referred in these volumes to the following articles:

Greece (History)	Peloponnesian War
Nicias	Pericles
Ostracism	Socrates

ALCOHOL, a clear, colorless liquid having the appearance of water, with an agreeable fruity smell and a burning taste. It is the alcohol in beer, wine, whisky, brandy, and other spirituous and fermented liquors that makes them intoxicating.

How It Is Made. Alcohol is composed of carbon, hydrogen, and oxygen, in proportions of two atoms of carbon to six of hydrogen to one of oxygen. It can be made by distilling wine, brandy, whisky, and other liquors, and for this reason it is sometimes called the spirits of wine, and sometimes simply spirits. It is manufactured from grains (chiefly corn), from potatoes, sugar, sago, tapioca, and molasses. These are fermented, as in the manufacture of beer or wine, and then distilled. A process of making alcohol from waste wood has been discovered, but up to the present has been little used. Alcohol is also an ingredient in liquors distilled or brewed from grapes and other fruits.

Properties. Alcohol is lighter than water, and in the open air at sea level it boils at a temperature of 173° F., while water must reach 212° before it boils. It will withstand intense cold without freezing, and is used in thermometers designed to measure temperatures lower than -40°, at which point mercury freezes. It burns with a light blue flame and intense heat, and is used in alcohol lamps in laboratories, and with chafing dishes and other devices in the home.

Commercial Uses. Alcohol dissolves essential oils, gums, resins, and many other substances that cannot be dissolved in water; consequently, it is extensively used in the

manufacture of varnishes, perfumes, and medicines. Ether and chloroform are made from it, and it is also employed for many other purposes in the arts. Some vinegar is made from alcohol, and in museums specimens are preserved by placing them in sealed vessels containing alcohol. The benefits derived from alcohol are many. Without it the world would be deprived of the valuable anesthetics, ether and chloroform, as well as some of the most effective medicines which are prepared as tinctures. Spirits of camphor consists of camphor dissolved in alcohol.

Denatured Alcohol. Denatured alcohol is alcohol to which something has been added to make it unfit to drink by rendering it poisonous. The most common kind of denatured alcohol is that to which methyl alcohol (wood alcohol) is added; another formula provides for a mixture of 100 parts of alcohol, ten parts wood alcohol, and a small quantity of benzine or some other substance. Denatured alcohol is being manufactured in ever-increasing quantities. Within five years after 1920 the quantity increased from 29,000,000 gallons to 68,000,000 yearly.

Chemical Composition. The chemist who wishes simply to designate alcohol as ordinarily understood uses the symbol C_2H_5O for its component parts—each molecule consisting of two atoms of carbon, six atoms of hydrogen, and one of oxygen, as above noted. However, alcohol is a hydroxide, and it is more scientifically expressed as C_2H_5OH , the final H indicating the hydroxide nature of the substance. As to purity, the ordinary alcohol purchased in pharmacies is about ten per cent water. Entirely pure alcohol—it can be made about ninety-nine per cent pure—can be produced by repeated distillation, by which the water content is gradually reduced.

Related Topics. For fuller inquiry into the story of alcohol and the various movements directed against its use, see the following articles in these volumes:

Anti-Saloon League
Local Option
Prohibition
Temperance
Wood Alcohol

ALCOR, *al kaw'r*.
See **DOUBLE STARS**.

ALCOTT, **LOUISA MAY** (1832-1888), a Massachusetts story writer, the author of probably the best-loved book of fiction ever written for young girls, entitled *Little Women*. Though she was born in Germantown, Pa., the family moved to Concord, Mass., when Louisa was eight years old, and there nearly all her life was spent. From the age of sixteen, she wrote



Photo: Brown Bros.

LOUISA MAY ALCOTT

She possessed the secret of laughter as well as of tears. Her charm for girlhood is less in the story that she wrote than in the tenderness with which she wrote it.

short stories for publication; for about ten years she taught school, thereafter giving herself wholly to writing. The family home was known as Orchard House; after the death of Miss Alcott it was purchased by the Alcott Association, that it might be a permanent



THE ALCOTT HOME, "ORCHARD HOUSE"

memorial of the author whose influence upon the youth of the land had been so remarkable.

The best of her books pertained to child life; the stories were penned in half-humorous, highly entertaining style, in which the influence of her father's teaching is evident; he was her chief tutor during her formative years. Miss Alcott did not reach out beyond the commonplace things of life for her plots; her treatment of everyday events raised them to a plane of interest and importance.

Her Work. Her first and greatest success, *Little Women*, was published in 1868; it is largely a record of the life experiences of herself and her three sisters in Orchard House. Previously she had produced *Flower Fables* (1855) and *Hospital Sketches* (1863), the latter an account of her experiences in a Washington military hospital during the Civil War. Her second success, *Little Men*, and *Jo's Boys*, which followed, continued the account of the family described in *Little Women*. In *Old-Fashioned Girl* and *Eight Cousins*, Miss Alcott expressed numerous views on the rearing of girls. These five books entitle her to fame, but widely read for many years were three other volumes, *Rose in Bloom*, *Jack and Jill*, and *Under the Lilacs*.

Amos Bronson Alcott, her father, was also a writer of note and a leader in the Transcendental school of philosophy and in the community known as Brook Farm. His best-known work is possibly *Concord Days*, whose theme centers about Transcendentalism. See **BROOK FARM**; **TRANSCENDENTALISM**.

ALDEBARAN, *al deb' a ran*. See **ASTRONOMY** (The Stars and Their Names); **TAURUS**.

ALDEN, *awl' den*, **ISABELLA McDONALD** (1841-), an American author whose books for girls, written under the pen name of **PANSY**, have been among the most popular American stories of their kind. She was born in Rochester, N. Y., edited several religious papers, including the *Christian Endeavor World*, and wrote some serious books for adults, among

which is a life of Christ. Her *Pansy* books are characterized by a high moral tone. In 1927 she published *The Fortunate Calamity*.

ALDEN, **JOHN** (1599-1687). In the records of the old colony of Plymouth, planted on the rock-bound coast of New England in 1620, there is mention of one John Alden who was hired "for a cooper at Southampton, where the ship *Mayflower* was victualled." The narrative goes on to say—"Being a hopeful young man, he was much desired, but left to his own liking to go or stay when he came here, but he stayed and married here." One would scarce know from these brief lines that a romantic interest attaches to the name of John Alden, but tradition has preserved his story for us, and it has been immortalized by Longfellow, though its hero rests in an unmarked and unknown grave.

In the division of the land into homesteads, John Alden was assigned to the house of the famous Captain Miles Standish, and the two became close friends. The Captain's wife died during the first winter, and the lonely husband, seeking someone to fill her place, turned his thoughts to Priscilla Mullins, "loveliest maiden of Plymouth." Though not afraid of shot from the mouth of a cannon, the sturdy Captain dared not face a possible "No" from the mouth of a woman, and so he commissioned his handsome young friend Alden to plead his cause. How John faithfully carried out the Captain's request, though he had dreamed of winning Priscilla for himself, and how the maiden interrupted his suit with the unexpected question—"Why don't you speak for yourself, John?"—may be read in Longfellow's well-loved epic of Plymouth colony, *The Courtship of Miles Standish*.

Of the personal appearance, character, and abilities of the first American Alden, colonial records have considerable to say. He was tall and handsome, and though only twenty-one when he embarked on that perilous journey to the New World, he eventually became one of the leading men in the colony. Of the company that signed the famous Compact in the cabin of the *Mayflower*, he was the youngest, and he outlived all of the other signers. Thrift and enterprise marked his entire career. A few years after his marriage to Priscilla, which probably took place early in 1622, he purchased a 160-acre farmstead in Duxbury, and the site of the first house in which he lived there is marked by a marble slab. Eleven sons and daughters were born to John and Priscilla, and in the list of their descendants we find the names of Henry W. Longfellow, William Cullen Bryant, John Adams, and Charles Francis Adams.

John Alden was one of the financial backers of the colony until its debt was wiped out in 1646; he acted as its business agent, and as



THE BRIDAL PROCESSION: JOHN AND PRISCILLA

From Painting by C. G. Turner

surveyor of highways. In 1632 he was appointed a member of the board of assistants to the governor, holding that office again in 1634-1639, and from 1650 until his death in

1687. Nearly all of the original farmstead at Duxbury has passed from the Aldens, but a house built by the founder of the family in 1653 is still preserved, and is owned by one of his descendants. B.M.W.

Related Subjects. For list of passengers on the *Mayflower*, see that article. See, also, STANDISH, MILES; COURTSHIP OF MILES STANDISH; PILGRIMS.



ALDER BLOSSOMS

ALDER, *awl' dur*, a genus of shrubs and trees belonging to the birch family, distributed generally throughout the north temperate regions. The common, or black, alder, which thrives in wet places in the temperate and colder regions of the United States, Canada, and Europe, is often of great importance while growing, for its spreading roots hold soil in place along the banks of rivers subject to overflow. The wood, light and soft and of a reddish color, is used for a variety of purposes, and is especially suitable for objects kept constantly in water, since it does not rot. The supports of the Rialto Bridge in Venice are of this wood. The beautifully grained roots and knots are valued for cabinet work, while the charcoal made from the burned wood is used in the making of gunpowder. The bark is utilized in tanning and leather-dressing, and it also furnishes a good dye of various shades of red and yellow. This common alder, though somewhat stiff, is a handsome tree, with large, roundish, deeply notched leaves and long reddish-yellow catkins. G.M.S.

Scientific Names. The alders belong to the family *Betulaceae*. The common alder is *Alnus glutinosa*, or *vulgaris*. Other well-known species are the smooth alder, *A. rugosa*; the hoary, *A. incana*; and the white, *A. rhombifolia*.

ALDERMAN, *awl' dur man*, a member of a city council, or board of aldermen, and consequently a legislator for his city. In most cities aldermen are elected by wards, each ward being entitled to one or two members, according to the provisions of the city charter. Aldermen are usually chosen for two years, and in cities having two aldermen for each ward, it is customary to elect one every year. The city council has power to enact ordinances (local laws) for the government of the city. In discharging his duties as legislator, each alderman is expected to look after the special interests of his own ward. He is nearly always a member of one or more standing committees of the board of aldermen, and thus his influence reaches over the entire city. Only in large cities are aldermen paid salaries; in smaller towns they usually serve without compensation. See **CITY**; **WARD** (in politics).

AL'DERNEY, one of the Channel Islands, the original home of the valuable breed of Alderney cattle. See **CATTLE**.

ALDRICH, NELSON WILMARTH (1841-1915), an American political leader, for thirty years Rhode Island's representative in the United States Senate, and for the last decade or more of that time its acknowledged leader. His knowledge of tariff and financial problems was probably not exceeded by that of any other man in Congress, and he was a master of parliamentary practice. He was wealthy and intimately connected with large financial interests, a combination which caused popular distrust of his views on banking; but to him belongs a large share of the credit for creating a demand for banking reform and for providing a solution, the Federal Reserve system (see **BANKS AND BANKING**).

ALDRICH, THOMAS BAILEY (1836-1907), an American editor, story-writer, and poet, for years a favorite of youthful readers as the author of a charming juvenile narrative of his own boyhood, called *The Story of a Bad Boy*. He was born in Portsmouth, N. H., lived in New England and Louisiana, and began a literary career in New York at the age of twenty-one. He wrote for several newspapers and periodicals, and in 1881, when William Dean Howells resigned from the editorship of the *Atlantic Monthly*, he succeeded to that position. After 1890 he devoted his time to writing and travel.

The house in Portsmouth where Aldrich lived as a boy, the scene of his *Story of a Bad Boy*, is now a museum containing interesting relics of the author. Aldrich's poetry is light, graceful, and musical, and shows careful workmanship, though it is not remarkable for depth or power. In artistic merit it has been compared to the poetry of Tennyson. His prose style is likewise delicate and polished.

What He Wrote. Important among his poetic

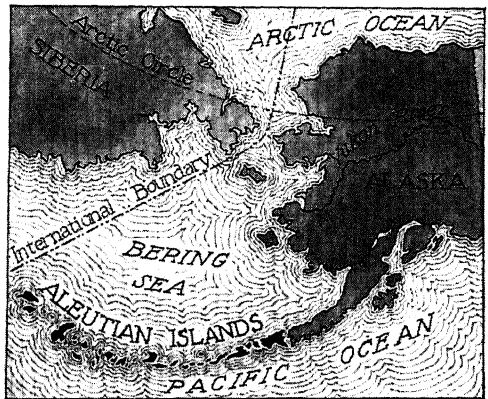
writings are *The Bells*, *The Ballad of Babie Bell*, *Cloth of Gold*, and *Unguarded Gates*. His prose works include *Marjorie Daw*, *Prudence Palfrey*, *The Still-water Tragedy*, and *The Queen of Sheba*. He also published a tragedy in blank verse entitled *Judith of Bethulia*.

ALE, a liquor much like beer, never so popular in America as in England. Any light-colored beer is commonly called ale, but there is some difference in the process of manufacture. In making ale, quite similar in process to beer-making, the fermentation is stopped before all the sugar is changed to other compounds, and is allowed to continue longer in the barrels. This makes ale stronger than beer. The pale color is due to the fact that the malt which is used is dried at a low heat, and consequently remains light colored. As ale contains from two to three times as much alcohol as does lager beer, it is correspondingly more harmful to the system if taken in large quantities. Water is often called *Adam's ale*.

ALECTO, *a lek' toh*, one of the three Furies (which see).

ALEPPO, *a lep' o*. See **SYRIA** (The Cities).

ALEUTIAN, *a lu' shan*, **ISLANDS**, a group of small islands extending southwest for over 800 miles in a graceful curve from the Alaska Peninsula, separating Bering Sea from the Pacific Ocean. There are about 150 islands in the group, which was formerly known as the



ALEUTIAN ISLANDS

From Alaska Peninsula to the westernmost island is nearly as great a distance as from New York to Chicago.

Catharine Archipelago, in honor of the Russian empress of that name. The present name refers to the Aleuts, the natives of the region. The area is 6,391 square miles. Most of the islands are small, all have rugged or mountainous surfaces, nearly all show the marks of volcanic origin, and on a number of them are extinct volcanoes. Hot springs are common, but some of the larger islands contain cool springs and rapid streams. Those containing soil are cov-

ered with growths of shrubbery, grass, moss, and lichens, but there are no large trees.

The most important island of the group is Unalaska, about seventy-five miles long and less than a third as wide. The peak Makushin rises 5,691 feet above the sea. The small town of Unalaska is on the island.

Until recently it was supposed that these islands were unsuited to any form of agriculture, but the largest have been found well adapted to the raising of livestock, and several ranches owned by Americans have been established upon them. The native Aleuts are a branch of the Eskimo stock. Population, about 3,000. See ALASKA; ESKIMO; ALEUTS.

ALEUTS, *al' i yutes*, a branch of the Eskimo family, native in the Aleutian Islands, the latter having been given their name. The origin of the word is unknown, unless the conjecture is correct that it is derived from the Indian *aliat*, which means *island*.

They occupy most of the Aleutian Islands (which see), and are scattered along the adjoining Alaska Peninsula and the northwest coast of the continent. When the Russians first occupied Alaska, the Aleuts numbered 25,000; now there are only about 2,000. At various times smallpox has killed hundreds in a single visitation. The Aleuts are best known as makers of fine baskets, the weaving and flexibility often approaching that of Panama hats. See ESKIMO. C.W.

ALEWIFE. The fish known commonly as alewife belongs to the same family as the herring and shad. It is found in great numbers on the Atlantic coast north of the Carolinas, and has many local names, including *branch herring*, *wall-eyed herring*, *ellwife*, and others. In some sections of Canada the fishermen call it *gaspereau*.

The name may be derived from the Indian *aloofe*, or from the supposed resemblance of the fish, in general contour, to a corpulent woman. Alewives are from eight to ten or twelve inches long, bluish above and silvery on the sides. They enter fresh-water streams in April and early May to spawn, returning to the ocean late in May. They have become landlocked in some of the lakes of Western New York. Their flesh, which resembles that of shad, is in great demand, but the supply is gradually diminishing. L.H.

Scientific Names. The alewife described above is known to scientists as *Pomolobus pseudoharengus*. A closely related species, called *glut herring*, or *black back*, is *Pomolobus aestivalis*.

ALEXANDER, the name of three important emperors of Russia.

Alexander I (1777-1825) came to the throne in 1801 on the assassination of his father, Paul I. He joined the union of the powers against Napoleon in 1805, but after severe defeats signed the Treaty of Tilsit (1807), in which he and Napoleon agreed to

divide the world between them. Alexander deserted Napoleon in 1812, which led to the latter's invasion of Russia and his disastrous retreat.

After the Battle of Waterloo, the Russian emperor joined with the emperor of Austria and the king of Prussia in the agreement known as the Holy Alliance. Alexander's policy in home affairs was at first one of progress and reform. He tried to improve the condition of the serfs, created new departments in the government, founded a national bank, and encouraged education, art, and literature. Later in his reign, however, he followed the policy of the Austrian statesman Metternich, the foe of popular liberty.

Alexander II (1818-1881) succeeded his father, Nicholas I, in 1855, before the end of the Crimean War. After signing the peace treaty at the end of that conflict, he set himself the task of bringing about national reforms. His greatest act was the setting free, under certain conditions, of over 22,000,000 Russian serfs (1861). He also founded a regular system of courts and public and scientific schools. During his reign the Russo-Turkish War of 1877-1878 took place. After 1863 Alexander became more and more despotic, which led to his assassination in 1881 by a Nihilist.

Alexander III (1845-1894) succeeded his father Alexander II in 1881, but was not crowned until 1883. Fear of attacks from Nihilists kept him a prisoner in his palace during his reign, and prevented him from adopting a liberal course. The people of the Baltic province and of Finland were given less liberty, the Jews were oppressed, and the Nihilists sternly held in check. In the affairs of Europe, Alexander was an advocate of peace, and without war succeeded in extending the Russian frontier in Asia. Though his reign was not eventful, his country made considerable progress through his encouragement of railroads and manufacturing. He was succeeded in 1894 by his eldest son, Nicholas II, the last czar of the Russians.

Related Subjects. The reader is referred in these volumes to the following articles:

Berlin, Congress of	Holy Alliance
Bonaparte, Napoleon	Metternich
Crimea (War)	Nihilists and Nihilism

ALEXANDER, the name of eight Popes, whose names and dates may be found in the article POPE. The most famous of the eight was ALEXANDER IV (Rodrigo Borgia, 1431-1503), who was born at Valencia, in Spain. He was in his early youth a handsome and gallant courtier, but he soon developed remarkable executive ability, and at the age of twenty-five was appointed a cardinal by his uncle, Pope Calixtus III. At the death of Innocent VIII in 1492, he became Pope. He set himself the task of reducing the power of the Italian princes and increasing the Papal revenues. Endowed with sagacity and fearlessness, he accomplished all he undertook. Among the events of his reign were the introduction of an index of prohibited books, the division of the New World between Portugal and Spain, and the burning of Savonarola. Two of Alexander's children, Caesar and Lucrezia Borgia, were very prominent in the life of their day.

Related Subjects. The reader is referred in these volumes to the following articles:

Borgia
Demarcation, Line of

Index Expurgatorius
Savonarola

ALEXANDER, JOHN WHITE (1856-1915), one of the greatest of American artists, who with Whistler, Abbey, and Sargent made up the so-called "big four" of their day. He was born in Allegheny City, Pa., became a telegraph boy, but showed such decided artistic talent that an employer enabled him to gain the art education he so much desired. After studying in Bavaria, Italy, Holland, and in Paris, he returned to the United States, where he soon became famous. Many distinguished men, including Oliver Wendell Holmes, John Burroughs, Robert Louis Stevenson, Rodin, and Walt Whitman, sat to him for their portraits.

[Particularly noteworthy are his mural paintings on *The Evolution of the Book* in the Congressional Library; they are reproduced in the article **BOOKS AND BOOK-BINDING**, in these volumes. His *Apotheosis of Pittsburgh* series is in the Carnegie Institute of that city.]

ALEXANDER I (1888-), king of Yugoslavia, a European state known officially as the kingdom of the Serbs, Croats, and Slovenes. Alexander was the second son of Prince Peter Karajorgjevic, who became king of Serbia in 1903. His mother was the third daughter of Prince Nicholas of Montenegro. The boy was educated in Russia. In 1909 he received the title crown prince because of the mental incapacity of his elder brother George, and three years later assumed command of the first Serbian army in the Balkan War, in which he showed great ability and courage.

Alexander became prince regent in 1914, when his father failed in health, and was commander in chief of the army when the World War began. He shirked none of the privations that befell his countrymen when Serbia was conquered, and until the end of the war remained true to the allied cause. When the Serbs, Croats, and Slovenes formally announced their union in 1918, Alexander accepted the title prince regent, and in 1921 he took the oath to uphold the new Constitution, becoming King Alexander I. In 1922 he married Princess Marie, the second daughter of King Ferdinand and Queen Marie of Rumania. See **YUGOSLAVIA** (History and Government).

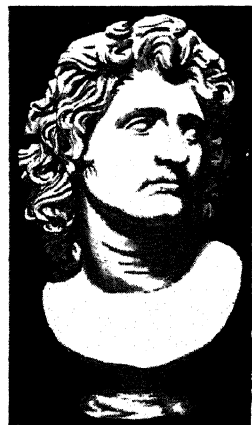
ALEXANDER ARCHIPELAGO. See **ALASKA** (Physical Characteristics).

ALEXANDER THE GREAT (356-323 B.C.), the most impressive figure of his age, and one of the most remarkable characters in all history. Among the mighty warriors of the past, he ranks with those whose genius has been effective in altering the current of the world's history—as dominating as Julius Caesar, Charlemagne, or Napoleon. Alexander was the son of Philip of Macedon, himself an able general and organizer. It is said that the young prince, even more ambitious and energetic

than the king, wept bitterly to hear of his father's conquests, for he feared there would be no worlds for him to conquer. At the age of thirteen, the youth became the pupil of Aristotle, who inspired the talented boy with an eager love for literature and philosophy.

When Alexander came to the throne of Macedon, at the age of twenty, he was confronted by conditions that would have disheartened a less resolute prince. The Greek states, restless under

Macedonian authority, were but waiting for an opportunity to revolt, and when the new king was away campaigning against some barbarian tribes on the northern border of Macedon, the Thebans rose in rebellion and persuaded the Athenians to become their allies. To this appeal the Athenians were not slow in responding, for the report had been circulated that Alexander was dead. But before the Greek

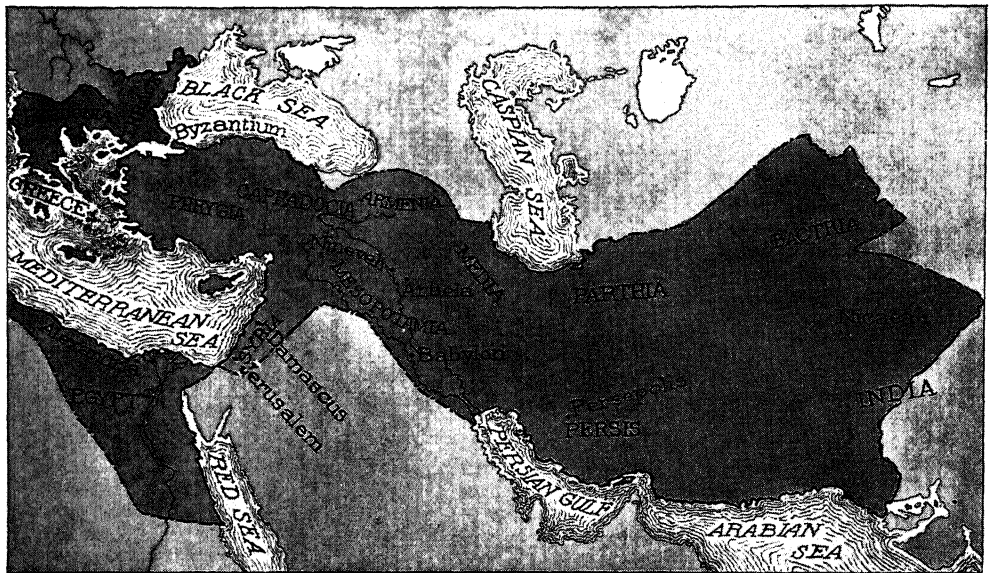


"ALEXANDER DEIFIED"

[From a bust in the Royal Museum, Berlin.]

cities had an opportunity to work out a plan of action, the king and his army appeared before Thebes. The city was stormed and every building within it destroyed, save the temples and the house of Pindar, while the inhabitants, 30,000 in number, were sold into slavery. This summary action quelled the spirit of rebellion, and all Greece submitted to the new ruler.

Conquest of the World. The next great project of the ambitious young monarch was the conquest of the Persian Empire. In the spring of 334 B.C., he crossed the Hellespont with an army of 35,000 and won a victory over the Persians that opened the gate to all Asia Minor. The following year, 333 B.C., he was opposed on the plain of Issus, on the north-eastern coast of the Mediterranean Sea, by a huge army of 600,000, commanded by Darius III, and again he was victorious. He then turned southward to Phoenicia, and after a memorable siege of seven months he captured the island-city of Tyre—perhaps his greatest military achievement. To accomplish this he was forced to build a causeway through the sea to the city; the ancient structure may still be seen. A terrible punishment was meted out to the brave Tyrians, for 8,000 of the people were slain, and the survivors, to the number of 30,000, were sold into slavery. All of the cities of Palestine and Philistia then submitted



ALEXANDER'S EMPIRE

His possessions at the height of his career.

to the conqueror, except the city of Gaza. After resisting a siege for three months, its people, too, were obliged to yield, and they suffered the same cruel fate as the Tyrians.

Alexander now was free to turn his attention to Egypt. In that country, however, he met with no resistance, for the Egyptians welcomed him as one who would deliver them from Persian tyranny. At one of the mouths of the Nile he founded a city which he named Alexandria, and which was destined to become a world center of commerce and of learning. While in Egypt he visited the famous temple and oracle of Jupiter Ammon, in the Libyan desert. There he heard from the oracle that he was the son of Jupiter and was destined to be the conqueror of the world.

In 331 B.C. Alexander began his march toward the heart of the Persian Empire. Darius, meantime, had collected another vast army, numbering, it is said, over a million men. On the plains of Arbela, near the city of Nineveh, the two armies met in battle. The Macedonians, though consisting of not more than 47,000 infantry and cavalry, were highly disciplined, and they drove the Persian hordes from the field with terrible slaughter. Arbela, one of the fifteen decisive battles of history, marked the end of the struggle between Oriental and Western civilizations. The triumphant Macedonian ruler next led his army to the city of Babylon, which submitted to him without striking a blow. Susa and Persepolis, each of which yielded him vast treasures of gold and silver, were his next prizes of war; the

inhabitants of the latter city were either massacred or sold into slavery.

Alexander had come by this time to regard himself as the successor of Darius, who had been slain by one of his own generals after his flight from the field of Arbela. In carrying out his plans as a world-conqueror, he led his army to remote regions, subduing tribes that dwelt along the southern shore of the Caspian Sea, and the peoples of Bactria and Sogdiana, beyond the towering Hindu Kush range. Many cities, some bearing his own name, were founded along his victorious march. In Sogdiana he killed his dearest friend Clitus, during a drunken quarrel—an act that overwhelmed him with remorse and showed him that though he was a conqueror of cities, he could not rule his own spirit.

The next country to acknowledge his prowess was India. Its fertile and populous plains were reached in 327 B.C. Nearly all of its native rulers submitted to him, and only the complaints of his toil-worn soldiers kept him from extending his conquests as far east as the River Ganges. It was therefore an opportune time for him to carry out a project that savored of peace rather than of war—to rediscover a lost water route between the Indus and the Euphrates rivers. Sailing down the Indus, he founded another Alexandria at the head of the delta, and then proceeded to the mouth of the river, which he discovered had its outlet in a great sea (the Indian Ocean). With the greater part of his army, he followed the coast westward, while his trusted admiral, Nearchus, was commissioned to explore the

sea with a fleet. Two months later the two joined each other in Carmania, in Southeastern Persia, and Alexander learned with joy that the lost route had been successfully navigated.

It was at this time that his favorite Thracian horse, the famous Bucephalus, died, and in its memory Alexander built the city of Bucephala, on the Hydaspes River in India.

Alexander was now the sole ruler of a vast realm stretching from the Ionian Sea to the Indus River, and his ambitious spirit projected brilliant schemes for the consolidation of what

endure. Whatever be the final estimate of his character, the achievements of Alexander the Great will stand out in bold outline so long as history is read. To him the world owes the preservation of Greek culture at a time when there was danger that Oriental ideals would dominate both the East and the West. By introducing the spirit of Greek civilization to the peoples of Egypt and Western Asia, he laid the foundations for the spread of Christian teachings, three centuries later.

Related Subjects. The reader is referred in these volumes to the following articles:

Alexandria	Hellespont
Arbela	Macedonia
Darius (III)	Philip (II)
Fifteen Decisive Battles	Pindar



SARCOPHAGUS OF ALEXANDER THE GREAT

was practically the civilized world. He contemplated nothing less than the union of all the nations into one great family, with one language and a common civilization. Not only did he himself marry an Asiatic wife—the daughter of Darius—but he persuaded thousands of his soldiers to follow his example. He hoped even to make the continents of Europe and Asia correspond in their natural wealth, by transplanting the vegetation of one to the other. Babylon was chosen as the capital city of the great empire. Unfortunately for the outcome of these plans, Alexander, whom Themistocles correctly judged to be “greater in genius than in character,” was given to debauchery and shameful excesses, and in 323 B.C., when he was but thirty-three years of age, he died of a fever brought on by self-indulgence. His body was conveyed to the Egyptian city of Alexandria, and over his coffin was erected a magnificent mausoleum. After his death his vast empire was divided among several rulers.

His Character. Because of his military genius, his interest in art, literature, and science, his ability as an organizer, and his far-reaching plans for the blending of the nations, Alexander deserves truly to bear his title “the Great.” The extraordinary talents of the man overshadow the defects that marred his character—his lack of self-control, his occasional outbursts of vindictive cruelty, his inordinate vanity. Yet he could be most kind and generous, and there was not one hardship suffered by his soldiers which he himself did not

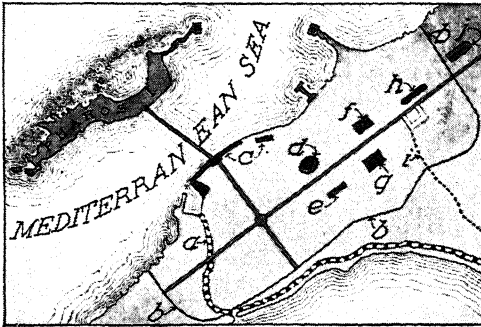
ALEXANDRA (1844-1925), daughter of Christian IX of Denmark and wife of Edward VII of England. After the death of the latter, in 1910, she was honored as queen-mother of England. Alexandra was born at Copenhagen. When nineteen years old, she was married to the Prince of Wales, and was at the time declared to be one of the most beautiful among the women of Europe. Her first public act as the Princess of Wales was to preside at the opening of the Cambridge School of Art (1865). A year later she was present at the opening of Parliament.

The death of the Prince Consort in 1861 was followed by the practical retirement of Queen Victoria from active social duties, and this talented daughter of the Danes took the queen's place in society, carrying the burden with dignity and grace. Alexandra was crowned with Edward VII on August 9, 1902, and reigned with him as queen until his death. She was an accomplished musician, and was everywhere respected and loved by the English people. In 1913 she celebrated her fiftieth wedding anniversary; her death occurred a few days before her eighty-first birthday. George V is her son. See EDWARD (VII, England).

ALEXANDRIA, *al ex an' dree ah*, EGYPT, a seaport which was long the center of Greek learning and civilization. It was founded by Alexander the Great in 332 B.C., at the northwest angle of the Nile delta, on a ridge of land between the sea and Lake Mareotis (see ALEXANDER THE GREAT). Its growth was rapid, and it speedily became a center of commerce between the East and West, with a population at one time of perhaps 1,000,000. It was especially celebrated for its great library and also for its famous lighthouse, one of the wonders of the world (see LIGHTHOUSE). Under Roman rule it was the second city of the empire, and when Constantinople became the capital of the East, it remained the chief center of trade; but it received a blow from which it never recovered when captured by Amru, general of Caliph

Omar, in 641. Its ruin was completed by the discovery of the passage to India by the Cape of Good Hope, which opened up a new route for the Asiatic trade.

Modern Alexandria is built largely on a peninsula which was formerly the island of Pharos. This is inhabited by Mohammedans, while on the mainland are Europeans, who



MAP OF ANCIENT ALEXANDRIA

- (a) Canal
- (b) City walls
- (c) City dockyards and quays
- (d) Amphitheater
- (e) Gymnasium
- (f) Library and museum
- (g) Hall of justice
- (h) Stadium
- (i) Aqueduct from the Nile
- (j) Hippodrome

make up about one-sixth of the city's population of nearly half a million. The former portion is crowded and squalid, while the latter is better built, and is supplied with water brought by the Mahmudieh Canal from the western branch of the Nile. Its two harbors make it one of the chief commercial ports on the Mediterranean. Its trade is large and varied, the exports being cotton, beans, peas, rice, wheat; the imports, chiefly manufactured goods.

At the beginning of the nineteenth century, Alexandria was an insignificant place of 5,000 or 6,000 inhabitants, but under Mohammed Ali renewed prosperity began for it. In 1882 the insurrection of Arabi Pasha and the massacre of Europeans led to the intervention of the British and the bombardment of the forts by the British fleet.

Alexandrian Library, the largest and most famous of all the ancient collections of books, planned by Ptolemy I, Soter, of Egypt, who died about 283 B.C. Succeeding rulers developed and enlarged the library, which at its most flourishing period is said to have numbered 700,000 volumes. Most of these were burned at the invasion of Alexandria by the Romans, and the remainder were destroyed by the Christians in A.D. 391.

ALEXANDRIA, LA. See LOUISIANA (back of map).

ALEXANDRIA, VA. See VIRGINIA (back of map).

ALEXANDRIAN AGE. See AGE (Historic Ages).

ALFALFA, OR LUCERNE, *lu surn'*, a plant cultivated extensively for hay, is one of the most valuable members of the legume family, which includes the clovers, peas, beans, and other pod-bearers. Alfalfa is one of the oldest of fodder plants (see LEGUMINOUS PLANTS). It was cultivated in Persia centuries before the Christian Era, and was taken to Greece by the Persian armies, as food for horses, during the early invasions of that country. The name *alfalfa* is from the Arabic for *best fodder*. The word *lucerne* is not, as often stated, of Swiss derivation. Some authorities consider it a corruption of an old Latin word that survives in Southern France in the form *laouzerdo*. This name is little used in America except in Utah and certain Eastern states.

Alfalfa was probably taken to Italy in the first century A.D. The Moors introduced it into Spain in the eighth century, and the early Spanish explorers carried it to South America and Mexico. It was after 1854, however, when gold-seekers from Chile carried the plant to San Francisco, that alfalfa became an important crop of the United States.

Description. Alfalfa is a cloverlike plant. It grows to a height of eighteen to thirty inches, and bears loose clusters of purplish flowers having petals like those of the pea. The seeds, kidney-shaped and about one-twelfth of an inch long, are borne in small seed pods coiled or twisted into two or three spirals. Alfalfa leaves are arranged alternately, and are made up of three leaflets with toothed margins. A striking characteristic of the plant is its perennial, deeply penetrating root system. The taproot sometimes extends fifteen to twenty feet into the soil, securing nourishment and moisture not accessible to other crops. It is thus an exceptionally good drought-resistant plant.

Conditions of Growth. The combination ideal for alfalfa would be a dry atmosphere, a moist but well-drained soil rich in lime, the presence of nitrogen-fixing bacteria, and a warm temperature. The seed bed should have a fine, mellow surface. Alfalfa is grown in the United States under widely varying conditions—in California below sea level, in a semi-arid region; on the highlands of mountainous states; under irrigation in the Arizona deserts; on the prairie land of the Middle West; and to some extent in the humid East. It will not thrive, however, on land where the subsoil is too compact to permit the roots to penetrate it, nor in a very wet or an acid soil. Where the soil is deficient in lime, which

counteracts acidity, this material must be supplied in some form.

A deficiency of nitrogen is also detrimental to alfalfa growth. As in case of other legumes, alfalfa is helped, in respect to nitrogen, by bacteria that are colonized in root nodules. These bacteria take nitrogen from the air, and after they have transformed it to the combined state, it becomes available for the use of the plant. With the death of the roots, the surplus of nitrogen that is "fixed" is left in the soil. When the nitrogen-fixing bacteria are absent, the soil must be enriched by artificial inoculation. This is accomplished by scattering over the field soil from land on which alfalfa has been growing, or soil from the roots of sweet clover. Specially prepared cultures may be obtained from the United States Department of Agriculture, and they are also obtainable as a commercial article.

Weeds are regarded as a very destructive enemy of alfalfa, for, being shallow-rooted, they rob the plants of the sustenance the surface soil provides. In seed-producing regions, the value of alfalfa seed is seriously impaired when contaminated by weed seeds. Of insect enemies, the alfalfa weevil and grasshoppers are the most troublesome. The alfalfa weevil at times has been so destructive that some states have placed embargoes on hay produced in infested regions. In the western part of the United States, gophers, mice, and other rodents eat the growing crops and are fought with poison bait and traps.

Uses. Approximately four-fifths of the alfalfa produced in America is cut for hay. The plant grows rapidly under the right conditions, and a crop matures in from thirty to forty days. In the southwestern part of the United States seven or eight cuttings a year are made. Considering productivity over a long period, it is probably best to cut the crop after the plants are well in bloom. Ton for ton, alfalfa is more valuable in feeding qualities than any other hay. The protein content is almost as high as in many concentrated foods. The following comparative table is reproduced from *Farmers' Bulletin* 339, published by the United States Department of Agriculture:

KIND OF FORAGE	DRY MATTER IN 100 LBS.	DIGESTIBLE NUTRIENTS IN 100 LBS.		
		Protein	Carbohydrates	Ether Extract
Alfalfa hay	91.6	11.0	39.6	1.2
Clover hay	84.7	6.8	35.8	1.7
Timothy hay	86.8	2.8	43.4	1.4
Wheat bran	88.1	12.2	39.2	2.7

Alfalfa is sometimes ground into meal and marketed in that form. Its food value is not lessened thereby, and the meal is often shipped more conveniently.

Large yields of honey are obtained in the irrigated regions of the West when bees have the range of alfalfa fields. Alfalfa honey from California is amber-colored; that from Colo-



ALFALFA MAP, UNITED STATES

Heavily dotted areas indicate sections of greatest production.

rado, Idaho, and Utah is lighter and of less pronounced flavor. Efforts have been made to produce bread, candy, and medicine from alfalfa, but without any marked success thus far.

Production. Alfalfa is raised, to some extent at least, in every state of the Union, but the areas west of the Mississippi River produce about ninety-five per cent of the yield. The leading states, in production, with order varying somewhat from year to year, are California, Nebraska, Idaho, Kansas, Colorado, Utah, Montana, South Dakota, Oklahoma, Oregon, and Washington. The annual crop is between 25,000,000 and 30,000,000 tons of hay. In the East, New York has the highest acreage and yield, the limestone soils in the central part of the state providing a favorable area for growth.

Alfalfa seed is produced in quantities only in hot, dry sections, and the production of seed is practically limited to the dry or irrigated regions in the western half of the country.

Alfalfa is not a leading Canadian crop. The annual yield of hay for the whole country is slightly over 1,000,000 tons; most of the crop comes from Ontario.

B.M.D.

Classification. Alfalfa belongs to the family *Leguminosae*. Its botanical name is *Medicago sativa*. Besides common alfalfa, a number of other commercial varieties are known. These include Grimm, Turkestan, Peruvian, and Argentine. Common alfalfa is the kind grown generally in the United States.

ALFIERI, *al fya' re*, VITTORIO, COUNT (1749-1803), the greatest dramatic poet that Italy has produced. To modern critics his works seem stilted and artificial; their lofty senti-



Photo: Brown Bros.

A KING SCOLDED BY A PEASANT

An artist's conception of the scene when Alfred allowed the cakes to burn. (Original painting by David Wilkie.)

ments are frequently expressed in monotonous language, but there are passages of real beauty, and Alfieri's high purpose is evident throughout. The Italian people reverence him for more than mere literary fame; certain of his plays, as *Virginia*, *Brutus*, and *Timoleone*, had a large part in awakening that feeling of nationalism which was the first step toward a united Italy.

Alfieri was born at Asti, in Piedmont. He traveled much, not always spending his time in a creditable manner, and in 1775 produced a tragedy, *Cleopatra*. His first taste of fame inspired him, and from that time on he worked with great singleness of purpose. His resting place is worthy of the awakener of Italian patriotism, for he lies in the Church of Santa Croce, in Florence, between Michelangelo and Machiavelli, and a monument by Canova (which see) stands above his tomb.

ALFONSO XIII (1886-), king of Spain, son of Alfonso XII and Maria Christina, Archduchess of Austria. Alfonso was long one of the interesting child monarchs of Europe, as his father died before his birth. Though proclaimed king on the day he was born, his mother, Maria Christina, ruled for him until he was sixteen years of age. Throughout his boyhood his kingdom was in a state of violent disorder, and in 1898 he saw practically the last of Spain's colonies lost in the Spanish-American War (which see). The loss of Cuba and the Philippine Islands as a result of that war was due to the typical Spanish tyranny that had

always characterized Spain's colonial policy. Alfonso had no part in this last drama.

He took personal charge of the government in 1902, and soon won the affection and confidence of the nation by his sincerity and courage. In 1906 he married Princess Ena of Battenberg, granddaughter of Queen Victoria. This union at the time pleased neither Spain nor Great Britain. The new queen adopted the Roman Catholic faith of her husband, and the English resented it; the Spanish people feared that an English princess in the royal house would prove an undue influence in the country's affairs. This fear proved groundless.

Alfonso has been on the whole a liberal king, and has used his influence to extend religious freedom in his kingdom. Social and political unrest have continued, however; this sincere king has several times been threatened with assassination, the first attack taking place on his wedding day. Alfonso is a patron of sports of all kinds, and often has to be dissuaded from participating in dangerous pastimes.

In 1923 he offered no objection to a dictator-



Photo: U & U

ALFONSO, KING OF SPAIN

ship of the country, by which autocratic power was given General Primo de Rivera in order to cope with internal disorders. It was hinted at the time that Alfonso welcomed the advent of strong military rule in the emergency that confronted the land. See SPAIN (History).

ALFRED THE GREAT (849-901), one of the world's greatest popular heroes, of whom it has been said that of all the monarchs to whom the title *Great* has been given, no other deserves it in point of character as does Alfred. Much legend has gathered about his name, but the outlines of his real history are well known. He was the youngest son of Ethelwulf, who reigned over the West Saxons from 836 to 858. Alfred came to the throne in 871, and found the country in a desperate state, owing to the inroads of the Danes. He made a truce with these enemies and induced them to turn their attention to the other provinces of Britain, but it was not long before they renewed hostilities, and so successful were their attacks that Alfred fled to the hills and woods for safety.

[One familiar legend tells how, during this period of hiding, he took refuge in a peasant's hut. No one recognized the king in the ragged and hungry traveler, and the peasant's wife asked him to tend the cakes which were baking before the fire. Wrapped in thoughts of his kingdom, Alfred forgot the cakes, which were burned to a crisp; and the peasant's wife, returning, scolded the king severely and struck him over the head. See illustration, page 204.]

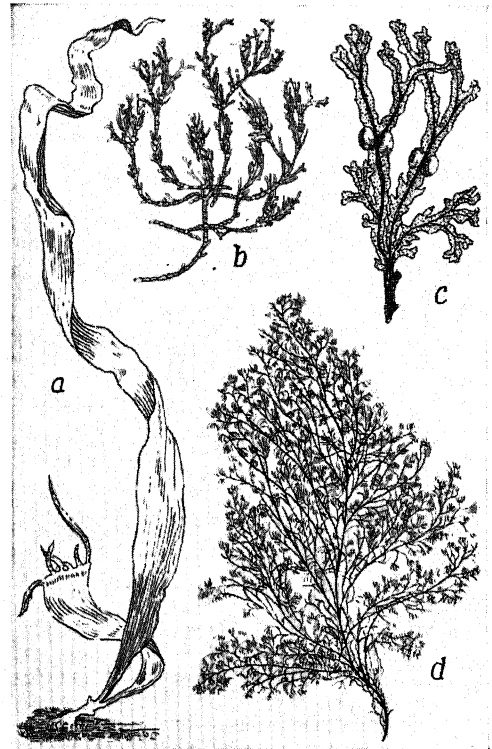
At length, having been joined by a band of trusty followers, Alfred prepared, in May, 878, to attack the Danish army under Guthrum at Edington. It is said that two or three days before the battle he entered the Danish camp disguised as a harper and gained all the information desired respecting the strength and position of the enemy, but this legend is generally discredited. In the battle that followed, the Danes were utterly defeated; Guthrum and his followers accepted Christianity, and were assigned territory north of Wessex. Alfred afterward ceded to them the eastern portion of Mercia, which became known as the *Danelagh*. Alfred was by this time the ruler of nearly all England, though never recognized by title as such.

Years of Peace. During the period of peace which followed, he rebuilt cities and fortresses and improved his fleet. Ships were stationed at intervals along the coast to guard against invasion, and were often useful in repelling the renewed attacks of the Danes. Alfred also established a regular militia, which was able to protect the several parts of the kingdom without leaving any district defenseless. He made a code of laws which served as the basis of later codes, and promoted trade and commerce. His last years were passed in peace. He was succeeded by his son, Edward the Elder.

Estimate. The selfish ambition and cruelty which stained the characters of other great rulers are not recorded in the life of Alfred. In the making and administration of laws, in his careful oversight of the courts of justice, in his promotion of the arts of peace, he had the welfare of his subjects ever in view. Of his military genius, the record of obstacles overcome is sufficient witness. He was in belief and in practice a devout Christian. Alfred is conspicuous for the patronage he gave to letters, and his own learning and industrious scholarship were most remarkable. To bring knowledge within reach of his subjects, he translated Bede's *Ecclesiastical History of England*, Gregory's *Pastoral Rule*, and Boethius's *Consolations of Philosophy*, from Latin into Anglo-Saxon, adding much of his own composition. Alfred represents all that is greatest and best in the early Christian civilization of the West, and was the herald of centuries far removed from him in point of time.

[For map of the dominions of Alfred the Great, see ENGLAND.]

ALFRED UNIVERSITY. See NEW YORK (Education).



RED AND BROWN ALGAE

(a) Deep-sea "devil's apron," (b) deep purple coralline algae, (c) bladder wrack, (d) a branching red variety.

ALGAE, al' je. The article BOTANY, in

these volumes, tells us that the plant kingdom is divided into four main divisions, and that the lowest division is made up of plants called *thallophytes*. The algae are the thallophytes which contain green coloring matter, chlorophyll. In spite of their simple structure, however, the algae represent the forms from which the more highly organized plants have been evolved. The 12,000 species are divided into five main groups, four of which are distinguishable according to color; these groups are known as the *blue-green*, *green*, *brown*, and *red algae*. Diatoms constitute the fifth main group of the algae.

Green algae are supposed to be the group from which land plants have been derived. Most of the green algae live in fresh water. Their green color is due to the presence of chlorophyll, a substance that makes them capable of manufacturing their own food. The green slime seen on rocks and scum on the surface of ponds are examples of fresh-water green algae.

The blue-green algae are also largely fresh-water. They are often found on the bottoms of temporary pools, but may occur in permanent bodies of water, such as lakes. Sometimes they are in such abundance as to color the entire lake water a grayish-green. Brown and red algae are usually found in salt water, and are the plants we call *seaweeds*. Kelps,

which furnish fertilizer and iodine, are brown algae. Floating brown algae known as *gulf-weed* constitute the masses of seaweed that entangled Columbus on his first voyage to the New World. The stems of these algae are sometimes over a hundred feet long. Red algae are not so bulky as the brown, and have a more complex structure. Irish moss, which is edible, is one of this group. G.M.S.

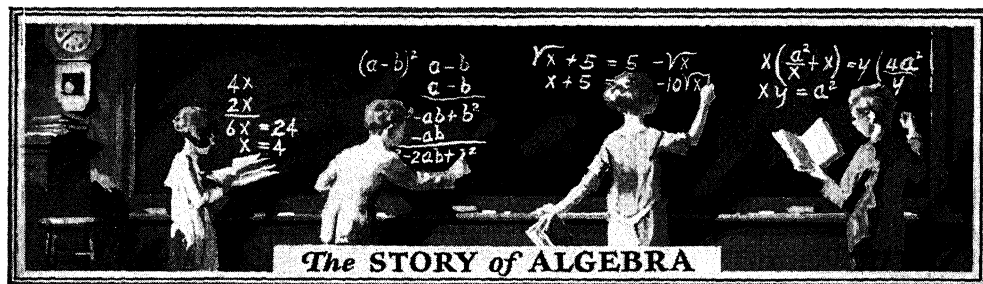
Scientific Names. The green algae are known botanically as the *Chlorophyceae*; brown algae are known as *Phaeophyceae*; red algae, as *Rhodophyceae*; and the blue-green algae, as the *Myxophyceae*.

Related Subjects. The reader is referred in these volumes to the following articles:

Chlorophyll
Diatom
Irish Moss

Kelp
Sargasso Sea
Seaweed

ALGARDI, ALESSANDRO (1602-1654), an Italian sculptor and architect, born at Bologna. His chief work was done in Rome, where he followed the style of his great contemporary, Giovanni Bernini. Algardi made the tomb of Pope Leo XI, in Saint Peter's, and for the same church a representation of Attila's retreat from Rome. The latter is the largest figure in high-relief in the world. His work as an architect is represented by the façade of the Church of Sant' Ignazio. It is as a sculptor that Algardi will be best remembered.



ALGEBRA. From the standpoint of history, algebra is not a new science. Its beginnings are in the remote past, traces of it being found as far back as 1700 B.C. or earlier; but there were many centuries during which the sciences and arts were greatly neglected, and it was not until the Middle Ages that the subject was revived and given attention by scholars.

One of the stumbling-blocks in the development of the study was the cubic equation. A partial solution was discovered by Nicholas Tartalea, an Italian, in 1530. This accomplishment brought him into conflict with Antonio Floridas, who had received from his teacher, Ferro, a solution of the equation which differed somewhat from that of Tartalea. The dispute was settled by a public debate in 1535, in which Tartalea proved the superiority of his method. His victory was proclaimed in

Italy, and he prepared to publish his discovery. Before doing so, he entrusted his solution to his friend Cardano, who swore that he would keep it secret. However, Cardano was writing a book, *Ars Magna*, printed in Nürnberg in 1545, and he could not resist the temptation to include Tartalea's discovery in it. So he broke his oath and gave the solution to the world as his own. As may be imagined, Tartalea was disheartened. He tried in vain to establish his claim to the right of discovery, but scholars to this day call his solution Cardan's Rule.

It is hard for us to realize the importance of this incident or the degree of interest shown in it by the people of Italy of that day. It is only one of the many mileposts on the journey of algebra from the dark ages to our own twentieth century. To-day, a mere beginner

in the study of algebra may know more about the subject than the wisest mathematician of antiquity.

A vital element in teaching is the recognition of *continuity* of subject matter. Let us find the continuity between arithmetic and algebra, the points common to the two subjects, where algebra touches arithmetic and belongs with it, and where the two subjects are distinct. Insight into these points makes clear the relation and interdependence of elementary-school mathematics and early high-school mathematics.

Very early in the elementary school the child is solving such problems as these: $7+8=15$, $9+7=16$; out of this grow 7 and what number equal 15, 9 and what number equal 16, and so on. Following the form above, the teacher writes $7+(a \text{ number})=15$, thus translating the problem into good form. This is *algebraic* in thought and form, as well as arithmetical. It very readily becomes $7+n=15$. It should be read freely, as follows:

"A number has been added to 7 and the answer is 15." Then follows the question, "What is the number?" The problem looks like this when completed:

$$\begin{array}{r} 7+n=15 \\ n=8 \end{array}$$

Most arithmetics write it $7+?=15$. This is algebra, but the authors fail to use good algebraic expression. The "?" is not good here. The word *number* or some symbol to stand for the word *number*, as *n*, the first letter of the word, is desirable.

In multiplication, the child says $6 \times 4=24$; $8 \times 9=72$. The teacher says, "I multiplied 7 by some number and got 56," and writes as she says it:

$$\begin{array}{r} 7 \times \text{number} = 56, \text{ or,} \\ 7 \times n = 56, \end{array}$$

then asks, "What is the number?" The problem appears:

$$\begin{array}{r} 7 \times n = 56 \\ n = 8 \end{array}$$

This is algebra in thought and expression, appearing early in arithmetic.

The area of a rectangle is 63; the length is 9. What is the width? The mathematics of the problem is this: 63 is the product of 9 and some number, and its best expression is, $63=9 \times w$. Again this is algebra in thought and in expression, although found in the middle grades of the elementary school. The expression soon takes this form:

$$\begin{array}{r} 9w=63 \\ w=7 \end{array}$$

I need \$18 to buy a coat. I have \$12. How much more must I get? Such problems come early to the child. It is arithmetic, and it is also algebra, and when given its best expression appears as $12+n=18$; when solved it is:

$$\begin{array}{r} 12+n=18 \\ n=6 \end{array}$$

In all the above illustrations the child meets the *algebraic thought* in his arithmetic, and should be taught the best expression for it, such as given above, which is the so-called *algebraic expression*.

The *solution* of each of these problems is *arithmetical*. It is reached directly by logic; it is not reached by the manipulation of an equation, which latter method belongs to algebra. The child says in arithmetic, "If $9w=63$, w equals $\frac{1}{9}$ of 63, or 7, or he writes:

$$\begin{array}{r} 9w=63 \\ \therefore w=\frac{1}{9} \text{ of } 63, \text{ or } 7." \end{array}$$

In algebra he says, " $9w=63$." Then he divides each member of the equation by 9 and finds $w=7$. He uses the equation as a machine. He has $9w=63$ as a balance; he knows that if he divides both sides of the balance by 9, the quotients form a balance. Thus it is seen that *in the solutions of the problem lies the great distinction between arithmetic and algebra*.

Farther on in the grades, the student finds such problems as this:

An agent working at 13% commission earned \$117. What was the amount of his sale?

The mathematics of the problem is this:

$$\$117 = \text{Sale} \times .13$$

The solution is:

$$\begin{array}{r} \therefore \text{Sale} = \frac{\$117.00}{.13} \\ \therefore \text{Sale} = \$900 \end{array}$$

This is arithmetic or algebra, as you please, in thought and form, but arithmetic in solution.

Another illustration, from seventh or eighth grade:

The area of a circle is 850 (square units, square feet, square yards, etc.). What is its radius?

$$\begin{array}{r} \text{Area} = \pi R^2 \\ \therefore 850 = \pi R^2 \end{array}$$

$$\therefore R^2 = \frac{850}{3.1416}$$

$$\therefore R = \sqrt{\frac{850}{3.1416}}$$

Here we have the best arithmetical thought and form, and so have we excellent algebraic thought and form. Indeed, again we say this thought and form belong not alone to algebra but to arithmetic and to *mathematics* in general.

This has not been recognized because the old "rule method" has been followed through the centuries in arithmetic—the telling how to do the problem, setting forth rules and classifying all problems under these rules. This method calls for no *expression* of the *relations* in a problem, but rather shows and calls for *processes*. Under it, the student begins by

adding or dividing, or finding square root, or whatever the rule dictates. Under the method suggested above (but not common enough today), the student attacks the conditions that create his problem, and translates them into mathematical language, which is the language we have so long called *algebraic*. With it as his tools, the student uses the *equation*—the *mathematical sentence*—and the signs and symbols that serve the purpose of placing before the eye the relations that exist in the problem. He does not hesitate to use a letter to stand for a number, any more than he does to use +, −, ×, =, and so forth, to stand for words. This mathematical expression is coming into use in the elementary schools through the earnest endeavor of a few of the best teachers of arithmetic. One of the weakest points in the course of mathematics is the lack of a recognized language of arithmetic such as is common to all mathematics beyond arithmetic. This lack is one of the big obstacles to the student beginning algebra.

The high-school teacher must take cognizance of this. The translating into mathematical language of the relations existing in a problem is new to the beginning student in algebra, and the teacher must guide him slowly and clearly through his own clumsy product into the concise, accurate, and refined method and language of the science. The steps are as follows:

First, he must learn to find the *mathematical relations* in the problem he reads; second, he must, by means of mathematical symbols, set forth those relations in the form of an equation; third, he must learn to use this equation as a machine which he must manipulate properly to solve his problem. This is a new view to him and so vital that if he fails to comprehend it he must stumble through stubble fields in his career in algebra, while if he gains command of it he will fly as in a finely constructed machine. The early days or weeks in algebra determine his control of the new method of thinking, and so these early days are vital.

The simple problems in arithmetic given above make good work for the beginning high-school student. Below are many further suggestions as to how the student passes on from arithmetic to algebra.

1. He indicates the perimeter of a room which is 17 ft. by 12 ft., thus: $17+12+17+12$, or $(2 \times 17) + (2 \times 12)$ or $2 \times (17+12)$.

2. He indicates the perimeter of a room 20 ft. long whose width he does not know, thus:

$$\begin{aligned} 20 + \text{width} + 20 + \text{width} \\ 20 + w + 20 + w \\ (20 + w) + (20 + w) \\ 2 \times (20 + w) \end{aligned}$$

The suggestion is given by the teacher that he may drop the sign × and he writes $2(20+w)$. Tell him that mathematicians have agreed

to drop multiplication signs in such cases as this, and between letters and between a digit and a letter, but *expect to repeat it many times*, for he has years of background to the contrary. The new form should come gradually, not be imposed suddenly.

The teacher says, "Show me the area of the floor of the first room," and the student writes, " 17×12 ."

"Show me the area of floor and ceiling." The student writes, " $(17 \times 12) + (17 \times 12)$, or $2(17 \times 12)$."

"Show the area of the second floor." " $20 \times w$ or $20w$."

"Area of floor and ceiling." " $(20 \times w) + (20 \times w)$ or $2 \times (20 \times w)$ or $2(20 \times w)$ or $2(20w)$."

"I paid 45 cents for melons this morning. I paid c cents apiece. How many did I buy?" " $45 \div c$."

Teacher tells him the \div is dropped and the fraction form is used from now on, to show

division. The student writes $\frac{45}{c}$.

"A dealer sold 1,200 tons of coal for which he received d dollars. For what did he sell it

per ton?" The student writes $\frac{d}{1200}$.

"It is m miles from the coal mines to the city of Peoria. I traveled the distance in 16

hours. At what rate did I travel?" Ans. $\frac{m}{16}$ miles per hour.

"I sold 7000 bushels of corn at n cents per bushel and spent \$320. How many cents had I left?" " $7000n - 3200$."

"I worked a number of years at a salary of \$140 per month, and my expenses were \$117 per month. What did I save?"

$$\begin{aligned} (140 - 117) \times 12 \times n \\ (140 - 117) \times 12n \\ (140 - 117) 12n \end{aligned}$$

Perhaps by this time many of the class will write the last form immediately; however, do not fear to go back and forth from the algebraic to the arithmetical form. It does much to clarify and give real and lasting meaning to the new form.

Below are suggestions for making situations that would give rise to certain mathematical expressions:

$$n + \frac{n}{3} = 6500$$

$$n - \frac{3n}{7} = 64$$

$$900 - (600 + n)$$

The teacher directs: "Give a situation that would be expressed by each of the above." Students will give widely different problems:

1. A man collected a certain sum of money

Aug. 1 and $\frac{1}{2}$ as much on Aug. 2, and collected both days \$6500.

2. A man spent $\frac{1}{4}$ of his month's salary and had \$64 left.

3. A farmer had 900 bushels of grain and sold 600 bushels at one market and n bushels at another. How many bushels had he left?

The teacher and children should express algebraically for each other situations they have in mind, and each try to fit situations to the other's expressions. Then each one should tell what situation he had in mind when he set down the expression.

When the student has learned to translate a problem into an equation, he has accomplished the first big step in algebra. The second step is a study of the meaning, use, and control of the equation, the algebraic machine. The equation as a machine is a new thought to the student. Indeed, in arithmetic he has violated with impunity the law of balance in the expression of his problems, and he may do so as long as he keeps awake to the relations in his problem, regardless of the form; but in algebra he places himself at the mercy of the equation; having once made it, he surrenders to it to take him where it will. This is all new to the beginning algebra student; indeed, this subject is a veritable fairyland; the magic wand is no greater wonder than this same equation which takes up his burden, releases his mental energy, and carries him through to the end if he but manipulates each crank and button skillfully.

The solution of an equation depends upon (1) changing the equation to desirable form to find the value of the unknown quantity, and (2) keeping the balance through all changes made in form.

The Negative Quantity. Another element in algebra new to the student beginning its study is the *negative quantity*; the idea that number extends on both sides of zero above and below is indeed new to him. The idea of the negative quantity can be illustrated in various simple ways:

1. A force acting in opposition to a force which is having a desired effect.

2. A debt.

3. Money spent when one desires to save.

4. Being carried west when one desires to travel east.

5. Game—"tug of war." The force exerted by each side is opposite, considered from point of view of opposing side.

6. Friction as opposed to moving force.

The combination, or so-called addition, of positive and negative quantities presents only a simple problem.

1. A group of boys are playing at moving a small wagon some distance north. Three boys pull north, one with a force of 12 pounds, another 16 pounds, another 20 pounds; another

pulls south 18 pounds, another pulls south 14 pounds. Combine the forces and the result shows $+12 + 16 + 20 + -18 + -14 = 16$. The wagon moves with a force of 16 pounds in the desired direction. Many algebras do not use the small sign, and in these the problem would appear $12 + 16 + 20 - 18 - 14 = 16$.

2. Four brothers go into partnership to assume the debts of all and use the money of all. A has \$7,000 and owes \$9,000. B has \$20,000 and owes nothing. C has no money and is in debt \$2,000. D has \$30,000 and his debts are \$4,000. What is the result of the combination? Using small signs it appears: $+7000 + -9000 + +20000 + -2000 + +30000 + -4000$, or:

$$\begin{array}{r} +7000 \\ -9000 \\ +20000 \\ -2000 \\ +30000 \\ -4000 \\ \hline \end{array}$$

A negative quantity will cancel or destroy an equal positive quantity, and vice versa.

3. The thermometer was at 12° above zero at 10 A.M. It rose 17° , and then fell 9° . Indicate the changes and result, or combine the forces. $+12 + +17 + -9 = +20$.

Subtraction of negative numbers may be made clear.

(1) John has \$16 and Mary has no money, but owes \$8. What must happen to John that he may reach the same state as Mary? What must happen to Mary to reach John's state?

(1) -24 shows John went down, or lost 24.

(2) $+24$ shows Mary gained 24.

(1) -8

$+16$

-24

(2) $+16$

-8

$+24$

Ques. How far apart are they?

Ans. 24 points.

Ques. What direction does John go?

Ans. Negative.

Ques. How far?

Ans. 24.

Then answer, showing distance and direction. What is the

John's money = $+16$

	Mary's increase $+24$
John's decrease -24	

Mary's money = -8

difference between John's and Mary's financial standing? *Ans.* -24 .

Between Mary's and John's financial standing? *Ans.* $+24$.

The first means that John must lose, or get rid of in some way, 24. The second means that Mary must gain 24.

These would appear when set down in ordinary subtraction—

$$\begin{array}{r} (1) \quad -8 \\ +16 \\ \hline -24 \end{array} \qquad \begin{array}{r} (2) \quad +16 \\ -8 \\ \hline +24 \end{array}$$

Show difference between -7 and $+20$.

$$\begin{array}{r} -27 \\ \hline -7 \quad 0 \quad +20 \\ \hline +27 \end{array}$$

(1) Go from $+20$ to -7 . *Ans.* -27 .

(2) Go from -7 to $+20$.

Ans. $+27$.

The thermometer was at 85° at noon, and at 70° at 6 P.M.

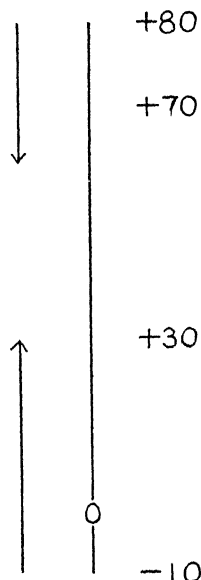
Change? -15 .

Thermometer was at 10 below at midnight and at 30 above at 10 A.M. What was the change?

There was a rise of 40:

$$\begin{array}{r} +30 \\ -10 \\ \hline +40 \end{array}$$

Such problems may have infinite variety.



The Foundations of Algebra

In this treatment of the subject, it is possible merely to explain fundamental principles, and to show how simple and reasonable the boy or girl can find this hitherto unknown science. There are many new things to be learned that were not treated in arithmetic; the reason for the existence of every new principle is not at all difficult to understand, and if the young student masters each principle in turn, the entire subject may become a delightful recreation.

Signs and Symbols. The signs used in arithmetic are carried into algebra without change of form and with meaning changed only in one particular:

$+$ (plus) indicates addition;
 $-$ (minus) indicates subtraction, and it has also a new significance, for it designates negative number;

\times (times) indicates multiplication;
 \div (divided by) indicates division, and
 $=$ (equals) is the sign of equality. Whatever appears on one side of this sign in an algebraic problem is exactly equal in quantity, number, or amount to that which appears on the other side of it. See *Simple Equations*, below.

In algebra, parentheses, braces, and brackets are called *signs of aggregation*, because everything within a pair of any of them is to be treated as a single quantity, which is to be simplified (reduced to its simplest expression) before being incorporated into other parts of a problem. Their treatment may thus be explained:

$$[12 + \{4 + 5 - (5 - 3) + 4\} - 4] = \text{what number?}$$

We first simplify the inside group $(5 - 3)$; after doing so the problem is stated in new form:

$$[12 + \{4 + 5 - 2 + 4\} - 4] = ?$$

Again simplifying the term within the inside signs, the problem becomes:

$$[12 + 11 - 4] = ? \quad \text{Ans. } 19.$$

This problem is purely arithmetical. When applied to algebra, there is no change in principle. Having observed the solution above, solve the following, which is purely algebraic:

$$[5a + 6a + \{5a - a + (3a + 4a)\} - a] = ?$$

If $a = 4$, what is the numerical value of the series?

Coefficient. The beginner in algebra at once finds a much-used term not employed in arithmetic—the word *coefficient*. As usually understood, it means any number or letter placed before another letter, and it indicates multiplication; a coefficient, then, is a *multiplier*. Thus, in the term $5a$, 5 is the coefficient of a , and indicates that the value of a is to be taken 5 times. After becoming a little more familiar with the principle, it will be seen that a as well as 5 is a coefficient—that 5 may be taken a times. So, really, 5 is the coefficient of a , and a is the coefficient of 5. To apply the principle further, in $a(x + y)$, a is the coefficient of $(x + y)$ and $(x + y)$ is the coefficient of a .

Signs of Parentheses. In the above paragraph we have learned that if several numbers or letters are to be treated as a single expression, they are joined together by being enclosed in parentheses. There are two rules laid down

for guidance in treating such aggregations. The first is usually stated in this form:

If an expression within parentheses is preceded by the sign $+$, the parentheses can be removed without making any change in the signs of the expression, and without altering values

It is a simple matter to prove this to be true. Let us do it in this way:

If a man has 40 dollars and later collects 8 dollars and then 2 dollars, it is immaterial whether he adds the 8 dollars to his 40 dollars, and afterwards adds the 2 dollars, or whether he adds to his 40 dollars the sum of 8 dollars and 2 dollars.

The first process may be represented thus: $40+8+2$.

The second process may be represented thus: $40+(8+2)$.

Hence, $40+(8+2)=40+8+2$.

Again, if the same man has 40 dollars and later collects 8 dollars and pays a debt of 2 dollars, it is immaterial whether the 8 dollars be added to the 40 and the debt be paid out of the sum, or whether the 2 dollars be paid out of the 8 dollars and the remainder be added to the 40 dollars.

In the first case, the process is represented by $40+8-2$.

In the second, it is represented by $40+(8-2)$.

Hence, $40+(8-2)=40+8-2$.

Prove that you understand the principle by simplifying the following:

$$5+(8-4)=5+8-4.$$

The simple form is $9=9$.

$$4+(8-2)+(6+1)=4+8-2+6+1.$$

There should not be the slightest difficulty in employing the above rule. The second needs a little deeper study:

If an expression within parentheses is preceded by the sign $-$, the parentheses can be removed, provided the sign before each term within the parentheses is changed, the sign $+$ to $-$, and the sign $-$ to $+$.

The first illustration, now that we are familiar with it, may be used with one variation, in explaining this second rule:

If a man has 40 dollars and has two bills to pay, one of 8 dollars and one of 2 dollars, it is immaterial whether he takes the 8 dollars and 2 dollars one after the other, or whether he takes the 8 dollars and the 2 dollars at one time from the 40 dollars.

We may represent the first process by $40-8-2$.

We may represent the second by $40-(8+2)$.

Hence, $40-(8+2)=40-8-2$.

If this man has his 40 dollars in the form of five-dollar bills, and has a debt of 8 dollars to pay, he can do so by giving two bills (10 dollars) and receiving 2 dollars in return.

We may represent this process by $40-10+2$.

If the bill paid is 8 dollars, that is, $(10-2)$ dollars, the number of dollars remaining may be represented by $40-(10-2)$.

Hence, $40-(10-2)=40-10+2$.

To make sure your understanding of the above, solve the following:

$$6-(4-2)=?$$

$$9-(4+3)=?$$

$$(6-2)-(5-2)=?$$

$$12-(8-3-2)=?$$

$$15-(6-2+3)=?$$

$$(14a-2a)-(6a-2a)=?$$

Numerical Values of Letters. Referring again to the term *coefficient*, we recall that a coefficient is a multiplier. Thus, in the expression $8a$, a , no matter what its value may be, is to be taken 8 times. It follows then that if $a=3$, the expression $2a+3a=6+9$, or 15; or, $2a+3a=5a$, or 15. When no coefficient is expressed, it is understood to be 1; $a=1a$, $b=1b$, etc. Apply these facts in the solution of the following problems. In a few instances results are stated to make the mastery of the principles easier.

If $a=4$, $b=3$, $c=2$, find the value of:

1. $8a-3bc$. (Ans., 14; in this case b and c are to be multiplied together, and 3 is their coefficient).

$$2. 4ac+5a.$$

$$3. 2(a-b+c).$$

$$4. b+3(a-c). \quad \text{Ans., } 9.$$

$$5. 4b-2(a+c).$$

$$6. 8c-b(a-b).$$

The last problem is here solved step by step. Compare with your own solutions and see if your methods are correct:

$$(1) 8c-b(a-b).$$

$$(2) \text{ Assigning values to the letters, } 8 \times 2 - 3(4-3)$$

$$(3) 16-3$$

$$(4) 13$$

Addition. The processes by which problems in addition are solved algebraically are much like those employed in arithmetical addition. When in arithmetic we add 4 and 6, we get a term expressing the result of this addition; it is 10. In algebra if we add a and a , we obtain the term $2a$ for a sum. If, however, we add a and b , we obtain no single term which will express this sum. To express the addition of algebraic quantities which are *unlike*, we connect the quantities with the sign $+$. To express the addition of algebraic quantities which are *like*, or *similar*, we add their coefficients. For example, $2x$ plus $3x$ plus $4x=(2+3+4)x=9x$. But x plus y plus $z=x+y+z$. Whenever two or more unlike quantities are added, the operation is algebraically complete when the quantities are connected by the sign $+$.

Add $3a$, $4b$, $6a$, and b . In this problem like terms are used twice. We must combine these before completing our addition, that we may have the expression in its simplest form. Combining similar terms:

$$3a+6a=9a.$$

$$4b+b=5b.$$

The addition completed is expressed:

$$3a+4b+6a+b=9a+5b.$$

The problem may be given this form:

$$\begin{array}{r} 3a+4b \\ 6a+ \quad b \\ \hline 9a+5b \end{array}$$

In the illustrative problems given above, all the terms have the plus sign expressed or understood. (When no sign is expressed, the sign + is always understood.) In the following problems, note that some of the terms have minus signs. In each case arrange like terms under each other in columns. Add like terms having plus and minus signs separately, then subtract the quantity representing the larger sum from that representing the lesser.

$$\text{Add: } 2a^3-b^2c+6bd^2+2d^3; \quad 4a^3+3b^2c-4bd^2-3d^3; \quad 3a^3+2b^2c+2bd^2-4d^3; \quad -2a^3-8b^2c+6bd^2+6d^3.$$

Arranging the terms in columns and adding:

$$\begin{array}{r} 2a^3-b^2c+6bd^2+2d^3 \\ 4a^3+3b^2c-4bd^2-3d^3 \\ 3a^3+2b^2c+2bd^2-4d^3 \\ -2a^3-8b^2c+6bd^2+6d^3 \\ \hline 7a^3-4b^2c+10bd^2+d^3 \end{array}$$

An explanation of any column will make these operations clear. Suppose we take the second, which contains the term b^2c . Adding the terms having the plus sign, we have $3b^2c$ plus $2b^2c$; their sum is equal to $5b^2c$. Adding $-b^2c$ and $-8b^2c$, we obtain $-9b^2c$; $-9b^2c$ plus $5b^2c$ equals $-4b^2c$. The quantity obtained in adding two like terms having unlike signs always takes the *sign of the numerically greater*.

Solve the following:

$$1. \text{ Add: } 4x^3+3y+5z; -2x^3+2y-4z; 3x^3-8y-z.$$

$$2. \text{ Add: } -3a-2b-c; a+3b-2c; 3a-6b+c.$$

$$3. \text{ Add: } 3a+4b+7y; 2b-3a+2y; 2a-5b-7y; 2a+2b+2y.$$

Subtraction. It is sometimes difficult for the beginner in algebra to understand the reason for the rule for algebraic subtraction. We will state it here as it is usually given, and then explain it step by step, using practical problems for illustration. The rule is:

Set the like terms one under the other in the minuend and subtrahend, then change all the signs of the subtrahend and proceed as in addition.

We have learned the principles underlying addition, and know that the algebraic sum of $8a$ and $-4a$ equals $4a$.

$$\begin{array}{r} 8a \text{ first quantity} \\ -4a \text{ second quantity} \\ \hline 4a \text{ sum.} \end{array}$$

In adding in arithmetic, we know that if either of two numbers be subtracted from their sum, the difference must be the other number. Here, then, if $-4a$ is subtracted from $4a$, the

remainder must equal the first number, which is $8a$. This is simply an application of an arithmetical truth, that in addition, if either of two terms is subtracted from their sum, the result, or remainder, is the other term; though the result may look unreal, it must be correct, because the above rule is correct.

Let us show further proof: If we add $-8a$ and $4a$ the sum is $-4a$:

$$\begin{array}{r} -8a \text{ first number} \\ 4a \text{ second number} \\ \hline -4a \text{ sum.} \end{array}$$

Subtract $4a$ from $-4a$, and the remainder, if the rule of arithmetic is correct, must be $-8a$, for $-8a$ is the other number.

Again, the sum of $-8a$ and $-4a$ is $-12a$, and the remainder must be the first term, $-8a$.

This will be made clearer if these last three problems in subtraction are placed side by side:

$$\begin{array}{rrr} \text{Minuend} & 4a & -4a & -12a \\ \text{Subtrahend} & -4a & -4a & -4a \\ \hline \text{Remainder} & 8a & -8a & -8a \end{array}$$

It should be borne in mind that in these problems in subtraction, the algebraic sum of each subtrahend and remainder equals its minuend. These are therefore the correct solutions of the problems given above.

It is advisable to learn the shortest method to use in subtraction and to know the simplest rule to be applied. By examining the above problems, we see that in each case we could have found the same remainder if we had imagined the signs in the subtrahends to have been changed and the minuends and subtrahends then added. Apply the following rule to each of the three solutions:

Arrange the problem so that like terms in the minuend and subtrahend will be one above the other; change all the signs in the subtrahend from + to - and from - to + and proceed as in addition. The result will be the remainder sought.

Multiplication. We have already learned that when we write down any number of algebraic quantities together without joining them by the plus and minus signs we indicate multiplication. That is, a times $b=ab$. When we set down graphically the product of $abcd$ and bc^2dy we find that b is taken twice as a factor, c three times, a once, y once, and d twice. The result of our multiplication, in expanded form, is $abbcccdy$, or, simplified, ab^2c^3ady .

The small figures at the right of and slightly above the letters are known as *exponents*; each indicates the number of times the letter is to be used as a factor; b^2 means the *square* of b , that is, b multiplied by itself, or raised to the *second power*. When a letter is written without any exponent, as b , we understand that the first power of the letter is meant. That is, $b=b^1$. It is clear, then, that when like quanti-

ties are multiplied, their exponents are added. Thus, $b^2 \times b = b^{2+1} = b^3$. But $a^2 \times b^2 = a^2 b^2$. We can combine exponents of like quantities only.

Now let us take a more complicated problem for solution:

$$\begin{array}{r} \text{Multiply: } 5b^2c + 2d \\ \quad \underline{3bd} \\ 15b^3cd + 6bd^2 \end{array}$$

It happens that the signs in this problem are all +. Let us see what steps to take when minus signs occur. Find the product of $-5a^2b$ and $3a$. If $-5a^2b$ indicates that $5a^2b$ is to be subtracted, then multiplying $-5a^2b$ by $3a$ is the same as subtracting $5a^2b$ $3a$ times, or subtracting the product of $5a^2b$ and $3a$ once. The product, then, is $-15a^3b$.

Let us analyze another problem. Multiply $-5a^2b$ by $-3a$. Multiplying these quantities may be considered equivalent to subtracting $-5a^2b$ $3a$ times. It must be remembered, however, that in subtraction the sign of the subtrahend is always changed; so, in subtracting $-5a^2b$ $3a$ times, we have the equivalent of adding $5a^2b$ $3a$ times, or of adding the product of $5a^2b$ and $3a$ once. Therefore the product is $15a^3b$.

Note the results in the following, where the operations are placed side by side:

$$\begin{array}{r r r r} 5a^2b & -5a^2b & 5a^2b & -5a^2b \\ \underline{3a} & \underline{3a} & \underline{-3a} & \underline{-3a} \\ 15a^3b & -15a^3b & -15a^3b & 15a^3b \end{array}$$

It is evident, from the above, that when the signs in the multiplier and multiplicand are alike, the product is a positive quantity and has the sign +; when the signs in the multiplier and multiplicand are unlike, the product is a negative quantity and has the sign -.

The following solution indicates the steps taken when the multiplier and multiplicand have more than one term:

$$\begin{array}{r} a^2 - 2ab + b^2 \\ a - b \\ \hline a^3 - 2a^2b + ab^2 \\ \quad - a^2b + 2ab^2 - b^3 \\ \hline a^3 - 3a^2b + 3ab^2 - b^3 \end{array}$$

The following problems may be solved for practice:

1. Multiply $4a - 3b$ by $3a + 4b$.
2. Multiply $a^2 - ab + b$ by $3a + b$.
3. Multiply $x^2 + 2x + y$ by $x - y$.
4. Multiply $x^4 + 2x^2y^2 + y^4$ by $x^2 - y^2$.

Division. We learned that in multiplying, exponents of like terms in the multiplier and multiplicand are added; in division, which is the reverse of multiplication, the quotient is obtained by subtracting the exponents of like terms in dividend and divisor.

Divide b^3 by b .

$$\begin{array}{r} b \overline{) b^3} \quad b^2 \\ \underline{b^3} \\ 0 \end{array}$$

Proof: $b^2 \times b = b^3$. Also, $b^3 \div b = b^{3-1} = b^2$. This division may also be shown thus:

Divide b^3 by b .
 $b^3 = bbb$.

Divide bbb by b .

$$\begin{array}{r} bbb \\ b \overline{) } \\ \underline{bb} \\ 0 \end{array}$$

$$bb = b^2.$$

Divide $3x^4y^2z - 9x^3yz^2 - 6x^2y^3$ by $3x^2y$.

Solution:

$$\begin{array}{r} 3x^4y^2z \quad -9x^3yz^2 \quad -6x^2y^3 \\ \underline{3x^2y} \quad \underline{3x^2y} \quad \underline{3x^2y} \\ x^2yz - 3xz^2 - 2y^2 \end{array}$$

In long division, for convenience in multiplying, it is customary to write the divisor at the right of the dividend. The following is an acceptable form:

$$\begin{array}{r} 12a^2 + 18ab + 6b^2 \quad | \quad 4a + 2b \\ \underline{12a^2 + 6ab} \quad \quad \quad 3a + 3b \\ \quad \quad \quad 12ab + 6b^2 \\ \quad \quad \quad \underline{12ab + 6b^2} \end{array}$$

We find by inspection that $4a$, the first term of the divisor, is contained in $12a^2$, the first term of the dividend, $3a$ times. Multiplying this partial quotient $3a$ by the entire divisor, placing the product under the first two terms of the dividend and subtracting, we obtain $12ab$. We bring down and add to this remainder the next unused term ($6b^2$) in the dividend. By inspection we find that the first term of the divisor is contained in the first term of the new dividend $3b$ times. We multiply the entire divisor by $3b$ and obtain $12ab + 6b^2$. Subtracting this product from the new dividend, we obtain no remainder, and know that our division is complete.

The signs in the above problem are all plus.

Note the solution of the following problem, in which minus signs occur:

$$\begin{array}{r} a^2 - 2ab + b^2 \quad | \quad a - b \\ \underline{a^2 - ab} \quad \quad \quad a - b \\ \quad \quad \quad -ab + b^2 \\ \quad \quad \quad \underline{-ab + b^2} \end{array}$$

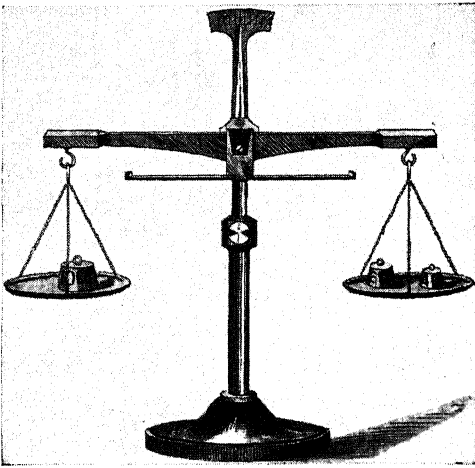
Note that when we divided the first term in the new dividend, $-ab$, by the first term in the divisor, a , we obtain as a quotient $-b$. Whenever a negative term is divided by a positive term, or a positive by a negative, the sign of the quotient will be minus. But a minus term divided by a minus term gives a positive quotient. Briefly stated, like signs produce

plus, and unlike signs produce minus quantities.

Solve for practice the following:

1. Divide $9x^2 - 18xy + 9y^2$ by $3x - 3y$.
2. Divide $a^2 - 12a + 35$ by $a - 5$.
3. Divide $3x^4 - 10x^3y + 22x^2y^2 - 22xy^3 + 15y^4$ by $x^2 - 2xy + 3y^2$.
4. Divide $a^5 - 2a^4 - 4a^3 + 19a^2 - 31a + 15$ by $a^2 - 7a + 5$.

Simple Equations. Two or more terms connected by the sign of equality ($=$) form what is known as an *equation*. The principles upon which the solutions of equations are based may be readily understood by using the familiar balance scale as an illustration. Suppose we have such a scale as is shown in the accompanying picture. In one pan we place a ten-



THE BALANCE SCALE

pound weight; in the other we place a six-pound and a four-pound weight. The first weight, we know, balances the other two, and this fact may be indicated by the following statement:

$$10 = 6 + 4.$$

Suppose we add 5 pounds to each pan. Then our statement is modified to read,

$$10 + 5 = 6 + 4 + 5.$$

If we now remove 3 pounds from each pan we have:

$$10 + 5 - 3 = 6 + 4 + 5 - 3.$$

From these statements, or equations, we may see that the following principles are true:

1. The same quantity may be added to both sides of an equation, or be subtracted from both sides, without changing the validity of the equation.
2. We may multiply or divide each side of an equation by the same quantity without changing the validity of the equation (*except that we must never multiply or divide by zero*).

By the application of these rules, we may find the numerical values of unknown quanti-

ties. In the equation $10a + 2 = 32$, we have stated that 32 is 2 more than $10a$, or that to $10a$ we must add 2 to equal 32. If we wish to ascertain the number to which $10a$ is equal, we must subtract 2 from 32. Since we may subtract the same number from both sides of an equation and still preserve its equality, we may write:

$$10a + 2 - 2 = 32 - 2.$$

This is equivalent to $10a = 32 - 2$.

Simplifying, $10a = 30$.

Dividing both sides by 10, $a = 3$.

These operations are fundamental in what is known as *transposition*. When we change the form $10a + 2 = 32$ to the form $10a = 32 - 2$, we transpose a known quantity from one side of the equation to the other, and in doing so we *change its sign*. In the solution of simple equations by transposition, we work with two principles: known terms are placed on one side of the equality sign and unknown terms on the other; any term may be transposed from one side to the other if its sign is changed. As we learned above, when we transpose a term we are really adding it to both sides of the equation or subtracting it from both sides. Let us see how these facts are applied in the solution of practical problems:

1. A ditch 80 feet long is divided into two parts in such a way that one part is three times as long as the other. What is the length of each part?

As the length of neither part is known, we may represent the number of feet in the shorter part by x . The solution is stated thus:

Let x = number of feet in shorter part,
 then, $3x$ = number of feet in longer part.
 $x + 3x$, or $4x$, = number of feet in total length.
 $4x = 80$.
 $x = 20$, number of feet in shorter part.
 $3x = 60$, number of feet in longer part.

Proof: $60 = 3 \times 20$. $60 + 20 = 80$.

2. Find a number such that when 14 is added to twice the number, the sum will be 64.

If we represent the number to be found by x , we know that twice the number must be $2x$. Since 14 added to double the number equals 64, our next statement must read,

$$2x + 14 = 64.$$

Applying the rules we have just learned, we have,

$$2x = 64 - 14,$$

$$2x = 50,$$

$$x = 25, \text{ required number.}$$

Solve the following problems, using the above explanations as your guide:

1. The sum of two numbers is 60, and the greater is five times the less. What is each?
2. A man divided 75 dollars between two sons. To A he gave twice as much as to B. How much did each receive?

3. Four times a certain number is equal to the number increased by 36. What is the number?

4. John bought a certain number of apples. Had he bought three times as many, he would have had 20 more than the original number. How many did he buy?

5. An orchard yields 140 bushels of fruit. The number of bushels of peaches is 15 more than the number of bushels of pears. Find the number of bushels of each.

Hint: Let x = number of bushels of peaches, and $140 - x$ = the number of bushels of pears.

6. A farm of 160 acres was divided into three sections. The first was twice the size of the second, and the second three times the size of the third. What was the acreage of each?

7. A 45-acre farm was divided into three garden plots. The first was half the size of the third and the second half the size of the first and third combined. How many acres in each?

Problems Dealing with Two Unknown Quantities

As the next step in our work, we take up equations in which two unknown quantities occur. Though such problems are more complex than the ones given above, their solution is not difficult, if the philosophy of the simple equation is clearly understood.

Usual Methods. In solving problems involving two unknown quantities, several methods may be used to eliminate one of the unknowns. The methods most commonly used are elimination by *addition* or *subtraction*, and elimination by *substitution*. There are other methods, but they are less frequently employed than the ones explained here.

Elimination by Addition or Subtraction. Let us examine step by step the process of finding the value of two unknown quantities by the first method. This method is usually the simpler and easier of the two.

$$\text{Solve } \begin{cases} 3a + 4b = 34 \\ 6a + 3b = 33 \end{cases}$$

It is clear that if the first equation is multiplied by 2, it will be in such form that the first term will equal the first term of the second equation. The entire product will read: $6a + 8b = 68$. If we subtract the second equation from the first as it now stands, we will have a remainder of $5b = 35$. The value of b is then easily found. The various steps of the process are shown in the following statements:

$$\begin{array}{ll} (1) & \dots\dots\dots 3a + 4b = 34 \\ (2) & \dots\dots\dots 6a + 3b = 33 \\ (3) & \text{Multiplying (1) by 2} \dots\dots\dots 6a + 8b = 68 \\ (4) & \text{Bringing down (2)} \dots\dots\dots 6a + 3b = 33 \\ (5) & \text{Subtracting} \dots\dots\dots 5b = 35 \\ (6) & \dots\dots\dots b = 7 \end{array}$$

Having found the numerical value of b , it is an easy matter to apply that value in either of the original equations; in other words, to substitute in equation (1) or equation (2) the value of b .

Since we know that b equals 7, we use the value of $4b$, or 28, in the first equation, so that our statement now reads: $3a + 28 = 34$. In order to get both known quantities on the same side of the equality sign, we must transpose the 28. Then we have, $3a = 34 - 28$; $3a = 6$, and $a = 2$. The formal statement for the completion of the problem is:

$$\begin{array}{ll} (7) & \text{Applying the value of } b \text{ in (1)} \dots\dots 3a + 28 = 34 \\ (8) & \text{Transposing} \dots\dots\dots 3a = 34 - 28 \\ (9) & \text{Then} \dots\dots\dots 3a = 6 \\ (10) & \text{And} \dots\dots\dots a = 2 \\ (11) & \text{Proof} \dots\dots\dots 3a, \text{ or } 6, + 4b, \text{ or } 28, = 34 \\ & \text{and } 6a, \text{ or } 12, + 3b, \text{ or } 21, = 33. \end{array}$$

For practice, solve the problems given below, using either addition or subtraction to eliminate unknowns. The beginner will find it helpful to write out each solution fully, putting down the steps in order and thus making himself familiar with the principles involved.

$$\begin{array}{l} 1. \text{ Solve } \begin{cases} 4x + 3y = 25 \\ x + 12y = 40 \end{cases} \\ 2. \text{ Solve } \begin{cases} 3x + y = 16 \\ 2x + 2y = 20 \end{cases} \\ 3. \text{ Solve } \begin{cases} x + 5y = 34 \\ 4x + 3y = 51 \end{cases} \end{array}$$

Elimination by Substitution. By this is meant the process of clearing an equation of one of its unknown terms by substituting in either equation the value of one of its unknown terms found from the other equation, as in the following solution:

$$\text{Solve } \begin{cases} 2a + 5b = 31 \\ 3a + 4b = 29 \end{cases}$$

We will first transpose $2a$ in the first equation and thus get a statement for the value of b .

$$\begin{array}{l} \text{Transposing } 2a, \text{ we have } 5b = 31 - 2a, \text{ and} \\ b = \frac{31 - 2a}{5} \end{array}$$

Now we write the second equation of the problem, placing the new value of b in it. We thus have:

$$3a + 4 \frac{(31 - 2a)}{5} = 29$$

Before this equation can be simplified, it must be cleared of fractions, as follows:

$$3a + 4 \frac{(31 - 2a)}{5} = 29$$

$$3a + \frac{(124 - 8a)}{5} = 29$$

$$15a + 124 - 8a = 145.$$

Transposing the known quantities to the right of the equality sign, we have:

$$15a - 8a = 145 - 124, \text{ or } 7a = 21.$$

The following statements show the entire process step by step:

- (1) $\dots\dots\dots 2a + 5b = 31$
- (2) $\dots\dots\dots 3a + 4b = 29$
- (3) Transposing $2a$ in (1)
and dividing by 5. $\dots\dots\dots b = \frac{31 - 2a}{5}$
- (4) Substituting the value
of b in (2). $\dots\dots\dots 3a + 4 \frac{(31 - 2a)}{5} = 29$
- (5) Clearing of fractions. $\dots\dots\dots 15a + 124 - 8a = 145$

- (6) Transposing..... $15a - 8a = 145 - 124$
 (7) $a = 3$
 (8) Substituting the value
 of a in (3)..... $b = \frac{31-6}{5}$
 (9) $b = 5$

For practice, solve the following problems, using the method of eliminating by substitution:

- $$\begin{array}{l} 1. \text{ Solve } \begin{cases} 3x+6y=24 \\ 5x-3y=1 \end{cases} \\ 2. \text{ Solve } \begin{cases} 5x-3y=8 \\ 2x+2y=32 \end{cases} \\ 3. \text{ Solve } \begin{cases} 5x-y=14 \\ 11x+2y=77 \end{cases} \end{array}$$

Problems Involving Three Unknown Quantities

Problems involving three unknown quantities, though a little more complicated, present no special difficulties, for they may be solved by applying the rules for elimination to two of the given equations, and when the values of two unknown quantities are found, these may be substituted in connection with the third unknown quantity. The full solution of such a problem is given below:

Solve $\begin{cases} x + y + z = 10 \\ 3x + 2y + 4z = 33 \\ 9x + 3y - 3z = 18 \end{cases}$

- | | | |
|------|--|---|
| (1) | | $x + y + z = 10$ |
| (2) | | $3x + 2y + 4z = 33$ |
| (3) | | $9x + 3y - 3z = 18$ |
| (4) | Bring down (2)..... | $3x + 2y + 4z = 33$ |
| (5) | Multiply (1) by 3..... | $3x + 3y + 3z = 30$ |
| (6) | Subtract (5) from (4)..... | $-y + z = 3$ |
| (7) | Multiply (2) by 3..... | $9x + 6y + 12z = 99$ |
| (8) | Bring down (3)..... | $9x + 3y - 3z = 18$ |
| (9) | Subtract (8) from (7)..... | $3y + 15z = 81$ |
| (10) | Multiply (6) by 3..... | $-3y + 3z = 9$ |
| (11) | Add (9) and (10)..... | $18z = 90$ |
| (12) | Therefore..... | $z = 5$ |
| (13) | Substituting the value of
z in (6)..... | $-y + 5 = 3$ |
| (14) | | $-y = -2, \text{ or } y = 2$ |
| (15) | Substituting in (1)..... | $x + 2 + 5 = 10$ |
| (16) | | $x = 10 - 7, \text{ or } 3$ |
| (17) | Proof..... | $3 + 2 + 5 = 10$
$9 + 4 + 20 = 33$
$27 + 6 - 15 = 18$ |

Solve the following problems, testing in each instance the correctness of your work:

- $$\begin{array}{l} 1. \text{ Solve } \begin{cases} x+2y-z=10 \\ 3x+4y-5z=4 \\ 5x+y+z=38 \end{cases} \\ 2. \text{ Solve } \begin{cases} 2x+y-z=10 \\ 6x-3y+4z=0.3 \\ 9x-y-6z=4 \end{cases} \end{array}$$

3. A merchant sold to a customer 8 yards of silk and 4 yards of gingham for 18 dollars; at the same rate he sold to another customer 5 yards of silk and 10 yards of gingham for 15 dollars. What was the price of each per yard?

The conditions of this problem may be stated algebraically as follows:

Let x = number of dollars one yard of silk costs,
and y = number of dollars one yard of gingham
costs.

$$\begin{array}{r} \text{Then } 8x + 4y = 18 \\ \quad 5x + 10y = 15 \end{array}$$

These equations are solved according to the rules that have been given in the preceding paragraphs.

4. Three numbers have the following relations: three times the first plus the second plus twice the third equals 38; four times the first minus the second plus three times the third equals 40; and the first plus three times the second minus the third equals 12. What are the numbers?

Further Algebra. The basic principles of algebra have been covered in the preceding paragraphs, and if you have mastered the explanations therein given, you will be able to take up more advanced work. The subjects of fractions, factoring, highest common divisor, and least common multiple can be mastered by anyone who has an intelligent understanding of those subjects from the viewpoint of arithmetic, and from them the student may work through the subject of quadratic equations.

The study of algebra can be made as absorbing as that of astronomy or literature, and it also offers exceptional opportunities for mental discipline, since it can be mastered only with persistent attention to detail, and it demands accuracy and concentration in the highest degree. I. W. V.

I. W. Y.

ALGECIRAS CONFERENCE, *al je si' rus*, an international meeting of representatives of the great powers at Algeciras, Spain, in 1906, to agree upon political policies to be employed by the European powers in Morocco, in North-west Africa.

The authority of the sultan had been undermined to a great degree by the intrigues of Europe, and in the effort to restore his prestige he dismissed all envoys of the powers from his capital. This aroused Europe, and failed of its object at home. To assure an orderly



government, England and France agreed that the latter should be given a free hand to control Morocco, while, in turn, England should be unopposed in working out its empire defenses in Egypt. The sultan was about to agree to plans of the French which would transfer nearly all political authority to France, when Germany unexpectedly interposed objections; Spain, more directly interested, had expressed satisfaction with the plans of England and France, for a Spanish zone along the coast had been agreed upon.

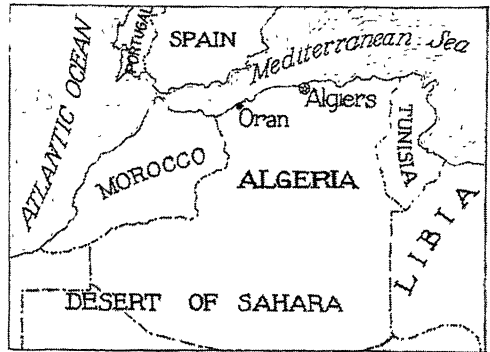
It was apparent that occasion for war was developing, so an international conference was called at Algeciras, at which were present representatives from nearly all the powers of Europe, and from the United States and Morocco. Important results were achieved. France was given powers which practically amounted to control of Moroccan affairs; Spain was given police control of two cities, Tetuan and Larache, in its zone of influence; France took the cities of Rabat, Mogador, Saffi, and Mazagan under control, and made Rabat the capital of the protectorate. The United States Senate ratified the compact, but disclaimed responsibility for assisting in the enforcement of its provisions. See MOROCCO.

ALGER, *ahl' jur*, or *awl' jur*, HORATIO (1834-1899), an American author of books for boys, whose *Ragged Dick*, *Tattered Tom*, and *Luck and Pluck* series have been sold by the hundreds of thousands. As the names suggest, they deal with penniless heroes who, by goodness, as well as "luck and pluck," reach success. Alger was for a time a Unitarian preacher, but, becoming especially interested in the lives of self-supporting boys, gave up his pastorate to help such boys, as well as to write about and for them.

ALGERIA, *al je' ri ah*, a country of 222,180 square miles, in Northern Africa, with 650 miles of Mediterranean seacoast on the north, and with Morocco and Tunis on the west and east. The southern boundary is indefinite and unimportant, merging into the arid lands of the great Sahara Desert. It is slightly larger than the combined states of Ohio, Indiana, Illinois, Kentucky, and Tennessee, and has a population slightly in excess of 5,800,000, of whom about 850,000 are Europeans. It has belonged to France since 1830, but has been a liability rather than an asset to the French until within recent years, during which its position has much improved. In another sense it is a valuable possession, since the position of France among the powers of Europe is strengthened by its ownership.

The Country and the People. The Atlas Mountains traverse the country in irregular lines from east to west, with a few elevations which reach 7,600 feet, but which average half

that height. In the northern and central sections the valleys and low plateaus are fertile and contain the homes of most of the people. Close to the coast, in a belt 100 miles wide, is the most fertile and populous region, called the *Tell*. The southern section merges into the desert, where the population is limited to possibly 100,000 wandering, clannish people.



ALGERIA

The country has no definite southern boundary, nor does it need one, for French influence prevails throughout the Sahara region to the south.

The natives are Berbers, often regarded as descendants of the Numidians, a theory which is probably correct, as present-day Algeria was a part of ancient Numidia. More numerous than these are the Arabs, and there are also a considerable number of Jews, who are more influential in the country's affairs than their numbers would indicate. All except the latter are of the Mohammedan faith; they are classed as natives, while the Jews are now French citizens. However, natives who served France in the World War, and native landowners, farmers, and licensed traders are also given citizenship.

Attractive Features. As a winter resort the country is not excelled, so far as climate is concerned; snow remains on the mountain peaks until May, but on the plateaus, along parallels of latitude with Atlanta and Los Angeles, the temperature is delightful most of the year. At lower altitudes intense heat is experienced. Those who wish to see desert conditions may do so, under circumstances as favorable as in most sections, by caravan routes to the very numerous oases. The people are worth studying; only a few hours from highly developed Europe are native customs and characteristics which have changed little with the passing of time.

Resources. The usual minerals of mountainous regions are abundant. Iron is extensively mined, and large capital finds profitable investment in this industry. Lead, copper, zinc, mercury, tin, antimony, and petroleum add to the mineral wealth. The Mediterranean

fisheries are important, including profitable sponge and coral industries.

The raising of figs, dates, oranges, lemons, and olives is developing at a remarkable rate, and this activity, with increase in mining, explains why Algeria is sure to become a

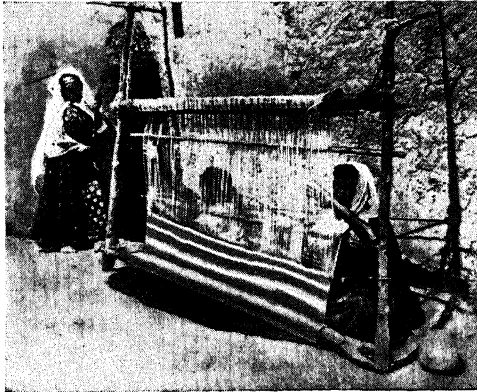


Photo: Keystone

WEAVING IN ALGERIA

Native women toiling before their primitive homes on the edge of the Sahara Desert.

profitable colony for France. The country produces more to-day than at any time since the Romans owned it before the Christian Era, when it was one of the famous granaries of the ancient world. To-day the production of wheat, barley, and oats is important, but the tropical products excel all others. Europeans manage nearly all the enterprises of the colony.

Government. France keeps in very close touch with the government of its colony. The governor-general, the ruler of Algeria, is appointed in Paris, and the two departments, or divisions, into which the colony is divided send representatives to the French National Assembly. This body makes the laws for Algeria. The Arab inhabitants have chiefs of their own, but the government takes no account of these and exacts the same obedience from its Arab as from its French subjects.

History. Modern Algeria was the Numidia of the Romans, and, as a colony of the empire, it prospered and developed a high state of civilization. The Vandals, however, put an end to its prosperity in A.D. 440, and little was then heard of it until the Mohammedan conquest in the eighth century. Arabs migrated to the country, and the Mohammedan religion became firmly established.

When the Moors were driven from Spain in 1492 by Ferdinand and Isabella, many of them settled in Algeria, and from that time for cen-

turies the country was known to outside peoples chiefly as the home of pirates who were greatly to be feared. The United States, in common with other nations, at one time paid tribute money to the outlaws of the Barbary States to insure safety for its commerce. (The account of America's experience with Barbary outlawry is told in the article **BARBARY STATES**.) England suffered like depredations, for the pirates' promises were nearly always broken; in 1830, after a French consul had been grossly insulted by the dey, or ruler, of Algeria, the French sent a fleet which reduced the country to utter dependence. It was many years before the insurrections were all put down. In 1871 civil government succeeded the military system that had been necessary up to that time.

Algeria is much interested in all plans for the development of the continent of Africa, and its government is pushing plans to assist in the commercial advancement of vast areas. A railroad is projected from the Algerian coast southward through the wastes of the Sahara to Lake Chad, and then toward the Belgian Congo and British South Africa; it is one of those vast projects which will one day help to make the "Dark Continent" enlightened throughout its area.

The Cities. There are three large cities, and several others with populations exceeding 25,000.

Algiers, *al jeers'*, a seaport on the African coast of the Mediterranean Sea, now capital of the French colony of Algeria. Supposed to have been founded in 944, it became the most important city of the Moors in the days of their great African empire. The city is advantageously situated on the slopes of a hill overlooking the Bay of Algiers. The ancient Moorish

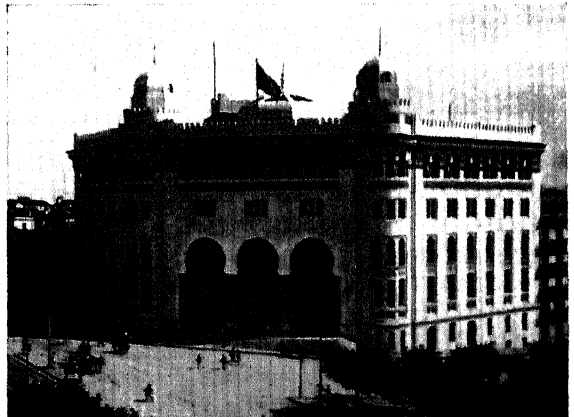
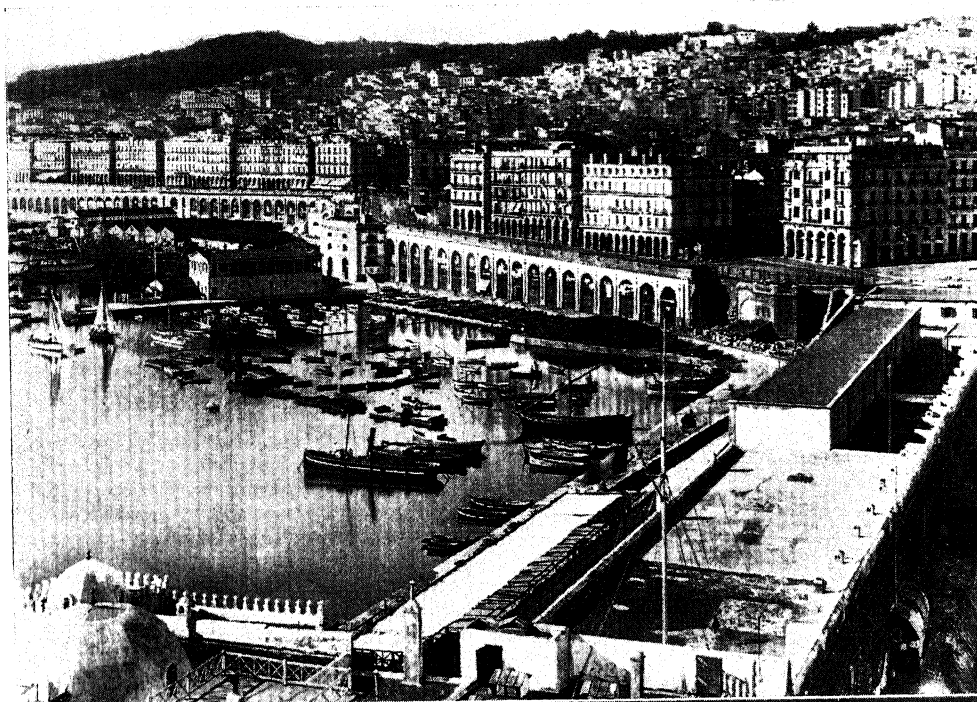


Photo: Visual Education

THE POSTOFFICE IN ALGIERS

section on the hill above the modern portion preserves the characteristics of Oriental cities many centuries old. The modern city differs in no essential respects from any progressive European community. Al-



Photos: U & U; Visual Education Service

North of the Desert. The city of Algiers presents a pleasing panorama from the harbor. Below: A mother and her children in the capital city.

though changeable, the climate is very healthful, and particularly desirable for invalids. Parisian manners and customs have been transported to Algiers, which is said, though incorrectly, to be "more French than Paris."

Extensive commerce is carried on with European countries, especially with France, Italy, England, and Spain. Algiers exports flour, esparto, wine, olive oil, and fruit. The population is about 226,000; nearly half are Europeans.

Oran, on the Mediterranean Sea, directly opposite Cartagena, Spain, was built by the Moors. It has a population of 150,000 and considerable trade with the countries of Southern Europe and with the interior of Africa. The city is old; some of its buildings, yet standing, date from the Moorish occupation. It was captured by the Spaniards in 1509, passed to the Turks in 1708, and again to Spain in 1732. An earthquake destroyed it in 1790, and it was abandoned in the next year. The French took possession of what remained of the city in 1831, and it was developed into a place of importance.

Constantine, situated a few miles inland from the sea, with good railroad facilities, is an old city, named for a Roman emperor, and was once an important town of Numidia. It was destroyed in A.D. 311, but was rebuilt at once by Constantine the Great. The native section is unattractive, but the French quarter is fine and modern. Its seaport is Philippeville. Population, 93,700.

Other Cities. Of lesser importance are Bona (47,500), Tlemcen (27,000), Philippeville (35,000), Mascara (30,000), and Mostaganem (28,000).

Related Subjects. The reader is referred in these volumes to the following articles.

Arabs	Berbers	Numidia
Barbary States	Moors	Vandals

ALGIERS, capital of Algeria (which see).

ALGOL, *al' gahl*, a variable star of second magnitude in the constellation Perseus, forming part of "Medusa's Head," which in the account in mythology Perseus carried in his hand, to turn his enemies to stone. The name is derived from the Arabic *al-ghul*, meaning the *ghoul*, or *destroyer*. Algol's variability, probably known to the Arabs, was ascertained to be periodic in the eighteenth century. This star loses two-thirds of its brightness in a period of nearly five hours, and returns to its original brilliancy in the next five hours. In two days ten hours, the process begins again. The waning is accounted for by the presence of a fainter satellite revolving about the star and partially obscuring it when directly in line between it and the earth.

Estimates of the diameter of the larger star vary from two to four times that of our sun. The other star is a little smaller, but is supposed by some to be the brighter. Estimates of their distance apart vary from 3,000,000 to 6,000,000 miles. Even the fainter star is much brighter than our sun. There is also a third star in the system, at a much greater distance. Algol's distance from the earth is more than 100 light years, a space too great

to be expressed in figures that convey any meaning. F.B.L.

Related Subjects. For illustration of Algol, see the star map, under ASTRONOMY (The Heavens in Autumn and Winter). See, also, PERSEUS, MEDUSA, STAR. The term *light year* is also explained in the article ASTRONOMY.

ALGONKIAN, *al gon' kie an*, **SYSTEM**, in the usage adopted by the United States Geological Survey, is the system of rocks formed during the Proterozoic Era. They are described in these volumes under that title. See, also, GEOLOGY. L.LaF.

ALGONQUIAN, *al gahn' kwie an*, **INDIANS**. See INDIANS, AMERICAN (Families or Confederacies).

ALHAMBRA, *al ham' brah*, the most splendid example of Moorish art in Europe, is an ancient palace and fortress of the Moorish kings of Granada in Southern Spain, situated on a terrace on the southeastern border of that city. The Moors built a citadel on the site of the Alhambra in the ninth century, as a protection against their Christian enemies. In 1248, after Granada had become the capital of the few remaining Moorish dominions in Spain, this was rebuilt, and additions were made up to the year 1354, when numerous halls and buildings had been erected, including a mosque. The name *Alhambra*, meaning in Arabic, *the red*, is probably taken from the sun-dried bricks that compose the outer wall. Thirteen towers rise upon this wall, which encloses an area of thirty-five acres. Within the enclosure are gardens made beautiful by fountains and waterfalls, trees and fragrant flowers, and the singing of a multitude of nightingales.

The Alhambra was captured in 1492 by the Spanish monarchs, Ferdinand and Isabella, in the same year that they started Columbus on his voyage of discovery. Though it has suffered at the hands of spoilers and from the marks of time, it is still a wonderful work of art, and the beauties of the palace have been copied by many artists and architects from that day to the present.

[An interesting account of the Alhambra is given in Washington Irving's *The Alhambra*.]

ALIAS, *a' li as*, a legal term for the name assumed by a person who wishes to hide his identity. Thus *Henry Morgan*, *alias Harry Nicol*, *alias Paul West* is the description in law for a man whose true name is Henry Morgan, but who has at times called himself by the other names, to avoid attracting the attention of the police, or for a similar questionable reason. An *alias writ* is one issued the second time in the same cause. A pen name or stage name is not an alias, but a *nom de plume*. See WRIT; NOM DE PLUME.

ALI BABA, *ah' le bah' bah*, the hero of the *Arabian Nights'* tale of *Ali Baba and the Forty Thieves*, who opened the door of the thieves'

cavern by using their magic password, "Open sesame." The life of Ali Baba was saved by the slave Morgiana, who poured boiling oil into the jars where the robbers lay hidden. See ARABIAN NIGHTS.

ALIBI, *al' i by*, a Latin word meaning *elsewhere*, is applied to a defense used in lawsuits, whereby a person accused of a crime attempts to show that he could not have committed the deed because he was in a different place at the time. If he succeeds in this proof, he is said to *establish an alibi*. An alibi supported by true evidence is the best possible means of proving the innocence of one accused, but this mode of defense also offers the guilty an alluring possibility of escape by the introduction of false witnesses and perjury. See PERJURY.

ALICE'S ADVENTURES IN WONDERLAND. See DODGSON, CHARLES LUTWIDGE.

ALIEN, *ail'yen*, a person residing in one country, but owing first allegiance to a foreign power. Thus, an Englishman may live in the United States for many years, but unless he transfers his allegiance by naturalization (which see), he is still, in the view of the United States, legally an alien.

The position of aliens differs in various countries. They owe a local allegiance and are bound equally with citizens to all rules for the preservation of order, but they have no political rights. For violation of law they are subject to punishment, and if their conduct is inimical to public welfare, they may be forced to leave the country. As a rule, they may acquire, hold, or dispose of property, both real and personal, in any way open to citizens, except that in some states foreigners can own real estate no longer than six years.

If an alien acquires property, he must pay his allotment of taxes for the support of the government, and he is liable, as in the case of citizens, to be called to serve in the militia or do special police duty in local defense of the laws which protect him. This is true throughout the British Empire, but in the United States a few states have not assigned such duties to aliens.

ALIEN AND SEDITION LAWS, four statutes enacted by the Congress of the United States in 1798, during the Presidency of John Adams, chiefly for the purpose of suppressing violent opposition to the administration, but also to end a movement, begun by Genet, which sought to secure American aid for France in its war with England.

The Alien Act, which remained in force for two years, gave the President power to order out of the country any non-citizens whom he considered dangerous to the government, and subject them to imprisonment if they failed to leave promptly. The Sedition Act was passed in July, 1798, and remained in force until March, 1801; it imposed a fine

not exceeding \$5,000 and imprisonment for not more than five years as a penalty for conspiring to resist government measures or for publishing libelous or scandalous statements concerning Congress or the President. A third law included harsh provisions applying to alien enemies, and a fourth made fourteen years' residence the qualification for naturalization.

The extreme character of these acts aroused great indignation, led to the Kentucky and Virginia Resolutions, and was partly, if not chiefly, responsible for the decline of the Federalist party.

Related Subjects. The reader is referred in these volumes to the following articles:

Adams, John	Kentucky and Virginia
Federalist Party	Resolutions
Genet, Edmond Charles	Naturalization



PARTS OF THE ALIMENTARY CANAL

- | | |
|-----------------------------|---|
| (a) Lower end of oesophagus | (g) Descending colon |
| (b) Stomach | (h) Rectum |
| (c) Pylorus | (i) Convolutions of the small intestine |
| (d) Duodenum | (j) The caecum, with the vermiform appendix |
| (e) Ascending colon | |
| (f) Transverse colon | |

ALIMENTARY, *al i men' ta ric*, **CANAL**, a

long tube which receives and digests the food taken into the body. It is about thirty feet long in an adult, or five or six times his height, and is lined throughout with soft, reddish mucous membrane. This is a thin, skinlike tissue, containing glands which secrete digestive fluids. Outside the mucous membrane are strong layers of muscular tissue, which push the swallowed food along its course.

The alimentary canal begins at the mouth, and includes the pharynx, oesophagus, stomach, and the small and large intestines. The small intestine for about ten inches from the stomach is called the *duodenum*; for the next eight feet it is called the *jejunum*; and for the remaining eleven feet, the *ileum*. The small intestine opens into the side of the large intestine by a slitlike valve. The beginning of the large intestine is a small pouch called the *caecum*; leading from the caecum is a small tube a quarter of an inch in diameter and two inches long, called the *vermiform appendix*, but the latter cannot be considered a part of the alimentary canal. Extending upward toward the liver from the caecum is the *ascending colon*; the intestine then crosses the abdomen to the left side, forming the *transverse colon*; the section passing downward from the latter is called the *descending colon*. The last section of the large intestine is the *rectum*. K.A.E.

Related Subjects. The various parts of the alimentary canal and pertinent allied topics are treated under the following headings:

Abdomen	Intestine	Pharynx
Digestion	Mouth	Stomach

ALIMONY, a sum of money, payable at one time or in installments at stated intervals, which a married woman is entitled by court decree to receive from the income of a faithless husband, after legal separation which may or may not reach the stage of divorce. It is never allowed by a court if separation results from misconduct of the wife, and may indeed be refused on any grounds whatever. While a cause looking to separation is pending, a temporary sum of money, known as *pendente lite*, for attorney's fee and living expenses, may be awarded, on proper showing; this terminates when the suit is settled. If the wife's plea is upheld, another decree is entered; this latter provides for permanent alimony, and may reach an amount equal to a third or more of the husband's average income.

Failure of a man to pay alimony as ordered is variously punished. In some jurisdictions amounts due become liens on the husband's estate; in others, the debtor may be imprisoned for contempt of a court order. Because of change in financial circumstances at any time, a husband may appeal to the courts for modification of the decree. See **DIVORCE**.

Alimony from the Wife. Though such instances

are very rare, a husband seeking judicial separation or divorce may seek alimony from his wife.

ALIZARIN, *a liz' a rin*, originally, a valuable coloring matter abstracted chemically from the roots of madder (which see). It is a compound of carbon, hydrogen, and oxygen, and has been so successfully manufactured from coal-tar products that the cultivation of madder for the dye trade has been largely abandoned. Alizarin is not only the source of the beautiful Turkey red so much in demand, but of a wide range of other colors, including blues, purples, oranges, browns, and yellows. Alizarin is a mordant dyestuff, that is, it needs to be combined in the fiber, or fabric, with certain chemicals to form insoluble color compounds. With aluminum salts, it forms a red compound; with iron in the form of ferric salts, a dark purple. See **MORDANTS**; **DYEING** AND **DYESTUFFS**. T.B.J.

ALKALI, *al' ka lye*. This Arabic word originally meant the ashes of certain plants called in English *saltwort* and *glasswort*. Its meaning was then extended to the most characteristic constituents of the *lye* made by treating the ashes of plants (for instance, wood ashes) with water, and then to a class of substances resembling these two constituents of lye, namely, *potassium carbonate* (potash, pearl ash) and *sodium carbonate* (soda, soda ash). Solutions of these two substances soften animal and vegetable tissues and therefore feel slippery to the fingers. Upon many vegetable and artificial coloring matters they have the opposite effect from acids. For example, they turn red litmus blue. They neutralize acids, forming salts, and act upon fats, making soap and glycerine.

When lime is added to a solution of sodium (or potassium) carbonate, a precipitate is formed. When this is allowed to settle, the clear liquid remaining is found to be a much more active lye than the original solution, and if the water is evaporated off, the white substance left is found to be much more soluble in water than the original carbonate. This product is called a *caustic alkali*, since it not merely softens but actually dissolves animal tissues. The caustic alkalies are the hydroxides (compounds with hydrogen and oxygen) of the metals of which the *mild alkalies* are the carbonates. The majority of modern writers on chemistry limit the term *alkali* to the caustic alkalies, but speak of all substances that affect litmus similarly as being alkaline, or having an *alkaline reaction*. In addition to sodium and potassium, the elements lithium, rubidium, and caesium have hydroxides which are caustic alkalies. These five metals, accordingly, are known as the *alkali metals*, or *metals of the alkalies*. Ammonia water, which resembles the caustic alkalies in its chemical action, is called the

volatile (that is, flying) *alkali*, because it will all evaporate away. In contradistinction, the original alkalies (mild or caustic) are termed *fixed*. The oxide of calcium (which is quicklime) and those of strontium and barium are called the *alkaline earths*, and these elements the *alkaline earth metals*.

Alkali Lands. These are soils which contain so large a proportion of soluble salts as to prevent or interfere with the growth of plants. These salts may come from underground deposits of sea salt left by the drying up of ancient seas. In a greater number of instances they have probably originated in that action of water and carbonic acid on the rocks by which the soil itself has been formed. In dry weather following rains, the salts crystallize out on the surface of the soil, leaving either a white or a black deposit. *White alkali* consists mainly of sodium chloride and sodium sulphate, and is often chemically neutral. *Black alkali* usually contains sodium carbonate, and is really alkaline in the chemical sense of the word. The black or brown color is due to the action of the sodium carbonate on the organic matter of the soil. Black alkali is the worst kind. Plants can stand about one-fourth of one per cent of sodium chloride or one-half of one per cent of sodium sulphate, but few of them will grow in soil containing one-tenth of one per cent of sodium carbonate. Black alkali soils are benefited by the application of land plaster (gypsum, calcium sulphate), which converts the sodium carbonate into the less harmful sodium sulphate and the harmless or beneficial calcium carbonate. Too heavy irrigation brings up the soluble salts from the subsoil, and so makes alkali soils worse. Sometimes it converts good soil into alkali land. Irrigation of hillsides often causes alkali trouble in the valleys, because the salts washed out of the highlands accumulate in the lowlands. The only permanent remedy for alkali in soils is to remove the salts by drainage.

Alkali soils are common in dry climates. They occur in many places in the western part of the United States. See **SOIL**. T.B.J.

ALKALOIDS, *al' ka loydz*, a class of chemical compounds found in plants, which includes the strongest poisons and the most powerful remedies known to man. Their names usually end in *ine* (or *in*), as *atropine*, *caffeine*, *cocaine*, *morphine*, *quinine*, and *strychnine*. An alkaloid, like an alkali, will combine with an acid to form a salt. It is, therefore, a base. An alkali, however, is mineral, or inorganic, whereas an alkaloid is vegetable, or organic. An alkaloid may be defined as an organic base, but the term is usually restricted to the vegetable world; the term for alkaloids formed in dead animal tissues is *ptomaines*. Most alkaloids are odorless, crystalline bodies, more soluble in alcohol than in water, but a few, such as nico-

tine, are liquid and mixible with water; the solids contain oxygen in addition to carbon, hydrogen, and nitrogen, which are present in all forms. Nearly all alkaloids, if taken in harmful doses, injure the nervous system. They frequently cause permanent paralysis of certain nerves and may even cause death. The possible dangers from their use make it advisable never to employ them except on the prescription of a physician.

Alkaloids are found in many plants, usually combined with organic acids. They often occur in the fruits and seeds, but sometimes in the roots and bark. *Opium*, a product of the unripe fruit of the poppy, contains a score of different alkaloids, of which *morphine* is the most abundant; the roots of the various species of *aconite* yield a dozen or more; *coca* leaves give *cocaine* and several others; and the barks of *cinchona* plants yield a group of over thirty, among them *quinine* and *cinchonine*. Coffee berries and tea leaves contain *caffeine*; cacao (cocoa) beans, *theobromine*; and tobacco leaves, *nicotine*. T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Aconite	Nicotine
Base	Opium
Caffeine	Ptomaines
Cocaine	Quinine
Morphine	Strychnine

ALLAH, *al' lah*, the Arabic name for the Supreme Being, corresponding to the name *God*. The word has made its way through all Mohammedan countries by means of the Koran, and *Allah Akbar* (God is great) is the war cry of the Moslems. The word was applied many centuries before Mohammed to a heathen god of the Arabs.

Related Subjects. The reader is referred in these volumes to the following articles:

Arabs	Koran	Mohammedanism
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ALLAHABAD, *al lah hab bahd'*. See **INDIA** (Cities).

AL'LAH AK'BAR, the war cry of Mohammedanism. See **ALLAH**.

ALLAN, *al' len*, the family name of Canadian financiers and shipowners.

Sir Hugh Allan (1810-1882) was born in Scotland. When sixteen years old he went to Canada and entered the employ of the leading grain-shipping and shipbuilding firm in Montreal. He progressed rapidly, became a junior partner in 1835, and in 1853 established a new line of ocean steamers called the Allan Line. He was one of the original promoters of the Canadian Pacific Railway, but the company organized by him lost its charter as the result of charges that the charter was obtained by bribery. Sir Hugh was knighted in 1871.

Sir Hugh Montagu Allan (1860-) succeeded to his father's large commercial and financial interests, and became active in the management of the Allan Line. He was knighted in 1904, and was created a commander of the Victorian Order in 1906.

ALLEGHENY, *al le ga' nie*, PA. See PENNSYLVANIA (back of map).

ALLEGHENY MOUNTAINS, the name of a range of mountains that extend across the states of Virginia, Maryland, and Pennsylvania from southwest to northeast. They consist for the most part of a series of parallel ridges, wooded to the summit, with some fertile valleys between. Their mean elevation is about 2,500 feet; but in Virginia they rise to over 4,000 feet. It is in these mountains that the great coal mines of Pennsylvania and West Virginia, also the iron mines of Pennsylvania, are found. They form the richest coal-mining region in the United States. The name is sometimes wrongly applied to the entire Appalachian system (see APPALACHIAN MOUNTAINS).

ALLEGHENY RIVER, one of the waterways which form the Ohio River. It rises in Northern Pennsylvania, about 2,000 feet above sea level, circles across the southwest corner of New York, returns to Pennsylvania, and continues its course of about 325 miles to Pittsburgh, where it meets the Monongahela; these two form the Ohio River. It is navigable only by small boats for 200 miles above Pittsburgh. The country through which it flows is very hilly, and the basin which is drained by the Allegheny and its many tributaries, the chief being the Clarion, has an area of about 11,000 square miles.

ALLEGORY, *al' le goh ric*, a word which means literally, *to speak other*, or to say something else than the exact thing which is meant. Thus when Jesus said to His disciples, "I am the vine, ye are the branches," he was speaking allegorically. The word is used to describe a form of literature in which a story is told not for its own sake but to present clearly and forcibly some abstract thought. The story should be interesting in itself, that it may hold the attention of its readers until the truth is driven home.

The very simplest allegories are the little beast fables, such as those of Aesop, which every child should know. For instance, the story of the "Fox and the Grapes" is told not just as an account of how a fox acted under certain circumstances, but to bring out the thought that people are apt to scoff at what they cannot attain. More elaborate allegories, and the most dignified ever written, are the parables of the Bible. No other language is as rich in allegories as the English, which possesses not only that most excellent specimen, Bunyan's *Pilgrim's Progress*, but Spenser's *Faerie Queene*, Swift's *Tale of a Tub*, and many other examples. See AESOP'S FABLES; FABLE.

ALLEGRETTO, *ahl lay gret' toh*. See MUSIC (A Course of Lessons).

ALLEGRO, *ahl lay' gro*. See MUSIC (A Course of Lessons).

ALLEN, ETHAN (1737-1789), an American soldier of Revolutionary fame, the hero of the capture of Fort Ticonderoga, who ordered the British commander at that post to surrender "in the name of the Great Jehovah and the Continental Congress." He was born in Litchfield, Conn., but removed to Bennington, Vt., a few years before the outbreak of the Revolution. He first came into prominence as the leader of the "Green Mountain Boys," a band of troops organized to expel from the "New Hampshire Grants," now Vermont, a number of settlers from New York. For this act the governor of New York offered a reward of \$750 for the arrest of Allen. Soon after the Battle of Lexington, Allen with his Green Mountain Boys started for Fort Ticonderoga, and on May 10, 1775, made a dramatic seizure of that stronghold, with the curt order quoted above. For this service he received the thanks of Congress. He was sent on a secret mission to Canada to learn the views of the Canadians as to rebellion, was captured and sent to England, but was returned to America, where he was confined in prison ships. On obtaining his freedom, Allen was appointed lieutenant colonel of the Vermont militia, and was sent as an agent to Congress to secure the admission of Vermont to the Confederation. Congress hesitated, and the British commanders endeavored to persuade Allen to restore the authority of the Crown. He was wrongfully accused of treason; it is known he desired only to advance the cause of the colonies. After the Revolution, he lived in retirement.

ALLEN, FLORENCE ELLINGWOOD (1884-), the first member of her sex to rise to the dignity of judge of the supreme court of a state. Miss Allen was elected to the Ohio supreme bench in 1923 for a six-year term, after filling lesser legal and judicial positions in Cleveland. She was born in Salt Lake City, was graduated from Western Reserve University in 1904, then became musical editor of a Cleveland daily paper and later a lecturer on music in the New York public schools. After completing a law course in the University of Chicago in 1910, she returned to Cleveland, and in 1914 began the independent practice of law. She was assistant prosecuting attorney for two years, then was elected judge of the court of common pleas for the term 1921-1926, but resigned on her elevation to the supreme court.

ALLEN, JAMES LANE (1849-1925), an American novelist who won high praise for his artistic style and sympathetic interpretation of life in Kentucky. He was born near Lexington, Ky., was graduated at Transylvania University, and after teaching at Kentucky University, became a professor of Latin and higher English at Bethany College, W. Va. By 1886 he had become so well known

through his contributions to magazines that he was enabled to move to New York and devote all his time to literature.

Important Writings.

His earlier works include *The Choir Invisible*, a tale of Kentucky in frontier days, dealing not with adventures, however, but with the inner life of its characters; *The Reign of Law*, a story of a young man's loss of religious faith and his recovery of it through the women he loves; and *A Kentucky Cardinal*, in which the beautiful cardinal bird plays a part in the lives of two young people. *The Doctor's Christmas Eve*, *The Heroine in Bronze*, *Sword of Youth*, *The Cathedral Singer*, *Kentucky Warbler*, *Emblems of Fidelity*, and *The Alabaster Box* are among his later works.



Photo: Brown Bros.

JAMES LANE ALLEN

ALLENBY, EDMUND, since 1919 Lord Allenby of Megiddo (1861-), the British commander in the World War who drove the Turks out of Jerusalem, the "cradle of the Christian world," and ended Turkey's power as an ally of Germany. Previous to 1914 his service was mainly in Africa—in Bechuanaland and Zululand and in the Boer War. In the World War he was a factor in allied victories on the Aisne and the Somme, and in the summer of 1917 was chosen to command in Palestine against the Turks. Jerusalem fell into his hands on December 10.

Until the World War was well advanced, Allenby was a major general. In 1917 he became a lieutenant general, and when assigned to Palestine was raised to the rank of general. His success in the East earned for him the decoration of Knight Grand Cross of Saint Michael and Saint George; after the war he was given the exalted military rank of field marshal, was raised to the peerage, and awarded a grant of \$250,000. In 1919 Allenby became high-commissioner in Egypt, holding that post two years. In 1926 he was elevated to the highest class of knighthood in the ancient Order of the Bath.

Related Subjects. The reader is referred in these volumes to the following articles:

Bath, Knights of the
Jerusalem

Palestine
World War

ALLENTOWN, PA., an industrial city, known for its manufacture of machinery, automobile trucks, silk, furniture, foodstuffs, and tobacco products. It is the county seat of Lehigh County, and is situated in the eastern part of the state midway between the northern and southern state lines, on the Lehigh River and Lehigh Canal. Philadelphia is fifty-six

miles southeast; New York City is ninety-two miles northeast. Population, 1928, 97,000.

The first settlement was named in honor of William Allen, then chief justice of Pennsylvania, who founded the town in 1752. It became the county seat of Lehigh County in 1811, when it was incorporated as Northampton Borough. Here, in 1799, John Fries of "Fries Rebellion" fame, aroused the German opposition to the window tax, a tax formerly imposed in Great Britain on all windows in houses above a certain number. In 1838 the original name was restored, and in 1867 Allentown was incorporated as a city.

Transportation. The city is served by the Lehigh Valley, Central Railroad of New Jersey, the Reading, and the Lehigh and New England railways; two electric and several motorbus lines communicate with other cities and extend as far as Philadelphia.

Industry. Allentown is among the first cities of the United States in the manufacture of silks, about 7,000 people being employed in its sixty-two mills. It is known also for the manufacture of metal products, machinery, and automobile trucks, there being approximately 6,000 persons employed in forty-four such plants. It is one of the largest furniture-producing cities in the United States, and also manufactures foodstuffs, cigars, shoes, lumber, hardware, knit goods, tools, souvenirs, and novelties. The annual value of its industrial output is \$125,000,000. A steel plant is located a half-hour's ride from the city, while the cement mills of the Lehigh district produce more than one-third of the total product of the United States.

Education. Muhlenberg College (Lutheran) and Cedar Crest College (Reformed) serve the higher educational needs of the city. In addition there are the Allentown Preparatory School, American Business College, Allentown Business College, twenty-eight public schools, and five parochial schools, in which 20,000 students are enrolled. W.D.R.

ALL-FOOLS' DAY, the name given to the first of April, a day quite generally devoted to playing absurd but harmless jokes. Its origin, though unknown, is not recent, as an old English almanac printed in 1760 contains the following rhyme:

The first day of April, some do say,
Is set apart for All-Fools' Day.

In English-speaking countries, the victim of a joke is called an April fool; in France, an April fish; in Scotland, a gowk. See APRIL, for panel-shaped illustration.

ALLIANCE, OHIO. See OHIO (back of map).

ALLIGATOR, *al' li gay tur*, a large reptile resembling the crocodile, from which, however, it differs in having a shorter and flatter head, differently constructed teeth, and feet less fully webbed (see CROCODILE). A few alligators are to be found in China, but for the most part they dwell in and about the waters of tropical America, where they may be seen during the day basking on the ground in the heat of the sun or floating near the surface of fresh-water streams. Formerly they were very

common along the shores of the United States from North Carolina southward, and far up the Mississippi River, but now they are seldom seen north of Florida. Millions have been

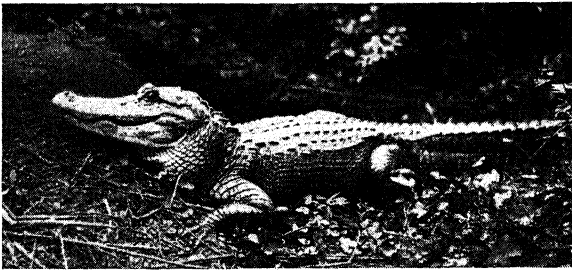


Photo: U & U

ON HER NEST

This mother alligator wears an apparently pleased expression. She does not have to keep the eggs warm, for they may be hatched by the heat of the sun, but on cool days she is faithful to her trust. This scene was photographed on the grounds of a gun club on Avery Island, Louisiana.

killed for sport and for their hides, which furnish a handsome, durable leather valued for hand bags, purses, bill cases and similar articles. Already the alligators have retreated to the remoter swamps and bayous, and their extermination in the wild state seems not far distant.

Alligators reproduce by eggs, which the female deposits in a nest consisting of several layers of mud and grass. These are slightly larger than hens' eggs, and are hatched by the heat of the sun and the warmth generated by the decaying vegetable matter. There are usually from three dozen to five dozen in a nest, though there may be as many as two hundred. The baby alligators, about eight inches long at birth, are carefully tended by the mother until able to look out for themselves. They are preyed upon by fishes, turtles, and sometimes by the male alligators. It was formerly supposed that alligators grow very slowly, but careful investigation shows that they may reach maturity in four to five years, under normal conditions. Large specimens fifteen to twenty feet long are rarely, if ever, seen now, thirteen feet being the size of a modern giant. Alligators may live to be several hundred years old. The young have bright-yellow cross marks, but these fade with growth, and adults are a black or dull gray.

Alligators feed on fish, birds, and mammals, and have been known to eat large dogs. Their powerful jaws and numerous sharp teeth can easily crush a man's leg or arm, but they do not ordinarily attack human beings, whom they have learned to fear; yet they will defend themselves viciously if attacked. Though somewhat awkward on land, they can bend the body in expert fashion and sweep a man off his feet with the powerful tail.

During the winter months they remain in torpid condition, buried in swamp mud or keeping under water. The adult males have a loud characteristic bellow, and emit a musky-smelling fluid from scent glands in the head.

Alligator Farming. The steadily diminishing supply of alligators has led to the conservation of these reptiles by means of alligator farms or ranches. One such ranch in the vicinity of Jacksonville, Fla., has had over 6,000 of these creatures at one time. Trappers get new stock for the farm by first blinding the alligators with the powerful light from bullseye lamps, and then thrusting out a long pole with a hook on the end. When the great jaws have snapped over the hook, the animal is drawn into a boat and securely tied. Their food consists of fish and low-grade meat. L.H.

Scientific Name. Alligators constitute a genus in the family *Crocodylidae*. The alligator of the United States is *Alligator mississippiensis*.

ALLIGATOR PEAR, better known as avocado (which see).

AL'LISON, WILLIAM BOYD (1829-1908), an American statesman, for eight years a member of the House of Representatives and for thirty-five years (1873-1908) United States Senator from Iowa. For twenty-five years before his death he was chairman of the important committee on appropriations, and during his long service practically every financial measure passed by Congress was at least partly his work. He was joint author of the Bland-Allison bill of 1878, which provided for the purchase of silver bullion and the coinage of a certain number of silver dollars each month. He took a prominent part in the discussion and amendment of the so-called railroad rate bill in 1906. He was several times a candidate for the Republican nomination for President.

Allison was born at Perry, O., and prac-

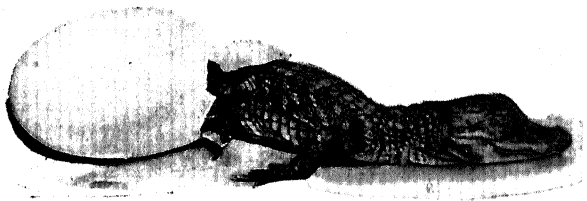


Photo: U & U

WHERE DO ALLIGATORS COME FROM?

This reproduced photograph answers the question. The baby alligator is emerging from the egg, in quite the same manner that a chicken is hatched.

ticed law in that state until 1857, when he removed to Dubuque.

ALLITERATION, *al lit ur a' shun*, the use of the same or similar letters or sounds at the



Photo: Wide World

A CALIFORNIA ALLIGATOR FARM

There are nearly two thousand alligators on this Los Angeles ranch. Some of the animals seen in the illustration are more than a hundred years old.

beginning of two or more closely succeeding words or syllables, as "*purged of pride*"; "*a damsel with a dulcimer*"; "*the cloth that cloaks the clay*." Early poetry, whether English, German, or Norse, had no rhyme, and alliteration was essential, and was arranged according to a certain definite scheme. To-day, though no longer looked upon as necessary, it is often employed to add beauty or to bring out certain effects—"apt alliteration's artful aid." Thus Keats conveys perfectly the impression of gentle waters against the bank when he says, "*I hear lake water lapping with low sounds on the shore*." Coleridge, Tennyson, Swinburne, and Kipling are among the modern poets who have used alliteration most aptly, Swinburne especially depending on it for many of his beautiful effects.

ALLOTROPY, *a lot' roh pe*, in chemistry, is the ability possessed by some elements to exist in different physical forms without losing their chemical identities. Carbon, for example, occurs in three pure forms—as charcoal, graphite, and the diamond. Charcoal is porous and brittle; graphite is soft and easily crumbled; the diamond is one of the hardest substances known. These three substances differ in their physical properties, but chemically they are identical, and when burned in oxygen they all form a compound of carbon and oxygen in the proportion of one to two. Oxygen occurs in the allotropic form ozone, which has, among other characteristics, an irritating odor. Sulphur and phosphorus

are other notable examples of elements possessing allotropy.

T.B.J.

Related Subjects. The elements mentioned in this article are described in these volumes under their own titles.

ALLOY, *al loi'*. If the wedding rings, brooches, and other jewelry which are sold in the stores as "solid gold" were really made of the pure metal, they would not wear well and would not long retain their shape, for pure gold is too soft to be serviceable for most purposes. Few metals, indeed, are fit to be used in a pure state, and most of the innumerable metallic objects which are in constant use are composed of mixtures of various metals. These compounds are called *alloys*. Such compounds are formed by melting together two or more metals, the object being to obtain certain qualities not to be found in any of the metals singly.

Various changes are produced in the properties of metals by combining them with others. In general, the resulting mixture, or alloy, is made harder, and becomes less capable of being hammered into sheets or drawn out into wires. The weight of an alloy, strange as that may seem, is sometimes less than the average weights of the metals of which it is composed. Then, too, an alloy is always more fusible than the metal most difficult to melt that enters into its makeup, and generally even more so than the most easily melted one. The nature of an alloy is not dependent alone on the kind of metals used. It may be greatly altered by varying the proportions of the same metals.

It is hard to overestimate the importance of alloys. Steel, bronze, brass, German silver, pewter, and solders are all alloys, and of each of these there are numerous varieties, formed by different combinations of the metals, each specially adapted to some certain purposes. The gold of which coins are made is 900 parts out of 1,000 pure gold, while the other 100 parts are an alloy of silver and copper in the proportion of 1 to 3. Silver for coins is 900 parts pure, the alloy in this case being copper. When gold is used in jewelry, it is measured in *carats* (which see), 24-carat being pure gold. Thus 20-carat gold is an alloy of twenty parts gold to four parts of some other metal or metals, usually silver and copper. Although articles made of 10-carat gold will not discolor, comparatively little jewelry is now made of less than 14-carat gold.

In modern industry alloys of steel are indispensable. The first metallurgist to analyze a steel that did not lose its edge when red-hot from friction was Robert F. Mushet, an Englishman. In 1868, while cutting metal at a lathe, he found a mixture of steel and tungsten in a tool. Since then various other metals have been found to give the alloy the same enduring quality when mixed with steel in the proper proportions. These metals are chromium, vanadium, cobalt, manganese, and molybdenum. Chromium, tungsten, and cobalt, when mixed together in proper quantities, make an alloy called *stellite*, greatly valued for high-speed tools, because the metal keeps a hard cutting edge and gets tougher as it gets hotter. Nickel and chromium are used to make the finely drawn wire of the electric toaster. The newer alloys are especially valuable for airplanes, since engines can be built from them that weigh as little as two pounds per horse power. T.B.J.

Related Subjects. The metals described in these volumes are listed at the close of the article METALS. For descriptions, the reader is referred to the various titles.

ALL-SAINTS' DAY, a Christian festival first celebrated by Pope Gregory IV in 835, when the Roman Pantheon was dedicated as a Christian temple. It is observed on November 1 and is designed to commemorate all the saints, thus honoring those not more signally remembered by days named solely for them.

ALL-SOULS' DAY, a Roman Catholic festival, observed on November 2, by prayers and the celebration of the mass for the relief of souls in purgatory. The custom arose in the eleventh century, and is marked in certain Catholic countries by lighted candles placed on the graves of the faithful and kept burning throughout the day. See PURGATORY.

ALLSPICE, the common name of a spice whose savor suggests the flavors of cinnamon, nutmegs, and cloves, mixed together. That is, it has an "all-spice" flavor. This condiment

is the dried berry of a West Indian tree belonging to the myrtle family and known as the *pimento* (which see). The berry is also called *Jamaica pepper*, because the tree flourishes on the island of Jamaica.

Allspice is used not only as a seasoning for food, but is employed in spicing liqueurs and pickles. Oil from the berries is sometimes used to perfume toilet soaps and to disguise the taste of medicines. The bark and leaves yield tannin, employed in tanning hides. The fruit of an allied species, the bayberry, supplies an oil that gives the characteristic flavor to bay rum. B.M.D.

Scientific Name. The tree that yields allspice belongs to the family *Myrtaceae*; its botanical name is *Pimenta officinalis*.

ALLSTON, *rol' stun*, WASHINGTON (1779-1843), an American painter whose work is characterized by nobility of conception and refined use of color. He was born at Waccamaw, S. C., studied art in New England schools, and was graduated at Harvard in 1800. While abroad, he attended the Royal Academy of London, and also made a special study of the master artists of the Venetian school. His imitation of their color effects won him the title "the American Titian."

Some of His Work. An early painting, *The Dead Man Revived*, is in the Pennsylvania Academy of Fine Arts. Other works include *Uriel in the Sun*, *The Prophet Jeremiah*, and *Belshazzar's Feast*.

ALL'S WELL THAT ENDS WELL. See Shakespeare (Synopsis of the Plays).

ALLUVIUM, *al lu' vi um*. Water is one of the chief agents which slowly but continuously change the surface of the earth. The materials produced by the erosive action of water are collected by the rivers and deposited along their lower courses and at their mouths. These deposits are known as alluvium, or alluvial deposits. They consist of sand, mud, gravel, clay, and the like, and are deposited either at the bottoms of the rivers, along their banks, or at their mouths, where they form deltas. The large tracts of fertile land found in the valleys and along the banks of many rivers have been formed by alluvial deposits left there by the streams in the course of many centuries. R.H.W.

Related Subjects. The reader is referred in these volumes to the following articles:

Delta	Erosion	Plain	River
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ALL-YEAR SCHOOLS, elementary-school organizations whose sessions continue through forty-eight weeks of the year, instead of the traditional thirty-six weeks or less. They are a development of the vacation, or summer, school and the playground movements.

Vacation schools were started in Boston, about 1879, to keep city children off the street and to provide wholesome occupation while

schools were closed. Newark, N. J., established the first vacation schools supported by public funds and under an official public body, in 1885. These were largely philanthropic in purpose and concept until about 1899, when Massachusetts passed a law permitting towns and cities to maintain vacation schools. In the next ten years such schools were either designed to keep pupils off the streets or to enable backward children to retrieve failure. During this period many large cities established vacation schools.

Newark, N. J., and Ardmore, Okla., established the first all-year schools in 1912. Summer schools have been preventive and corrective in concept. All-year schools are designed to be constructive, progressive, and adjusted to contribute to continuous advancement in regular school courses.

Plan. All-year elementary schools divide the course of study into twenty-four units. Three units, C, B, and A, comprise each grade. Eight grades are comparable with the eight grades of the traditional school. The all-year school calendar is divided into four terms of twelve weeks. One-third of the grade, or one unit of the course of study, is completed in each three-month term, and all pupils are required to attend at least three terms in a calendar year. The work of the summer term is the same as of other terms, except that more attention is given to recreation.

All-year high schools divide the course into twelve units. Three units, C, B, and A, are the equivalent of the customary high-school year of work. As in the elementary school, attendance for three terms is required during each year.

The all-year plan at its maximum affords opportunity for exceptional children to complete the elementary course in six calendar years and the high-school course in three calendar years. Comparing the plan at its minimum point with the historic school, it affords the slow child who attends continuously eight extra three-month terms in the elementary school and four extra three-month terms in high school, before such a child falls below the progress rate of a normal pupil in the traditional nine- or ten-months school-year type of organization. From the standpoint of the individual pupil or of the school administrator, these extra terms may be used to make additional progress or to redeem failures or to enrich the curriculum.

Merits. Reports of the United States Commissioner of Education show that the public schools of the entire country are in session but a little over 158 days. In some states the average is about 198, but in others it is less than 100. Moreover, because of irregular attendance, the average number of days which children from five to seventeen years spend in

school each year is a little over 84. If an educated nation is desirable, these figures show an opportunity to use more days to educate children. Moreover, schools work diligently to secure right habits in pupils. Much of school effort is wasted in reestablishing these habits after each summer intermission. Particularly in cities, the summer period of idleness results in vicious conditions and habits that are most undesirable.

Cities in America have grown in population until they cover great areas. Business activity is maintained in summer. The automobile has increased the number of families that remain at home through its use for weekend trips. Much of the population of every city is at home during the summer. Economic changes are decreasing one-family residences with adequate play space, and are substituting multiple-apartment houses. Few cities have provided neighborhood playgrounds adequate to meet this problem, and mothers are unable to provide healthful recreation and worthwhile occupation for the children. Schools are the best civic agency to cope with the situation.

Modern schools make provision for activity, relaxation, and variety. Strain has been replaced by a humanized program that makes the school a most enjoyable place for childhood. Modern schools are constructed to provide most healthful and aesthetic conditions for child activity. Wherever part-time summer schools are opened, children attend in large numbers. In Newark, N. J., where summer schools have the longest history, the attendance at the part-time sessions is large, but wherever a Newark summer school has been made an all-year school, the summer-time attendance has immediately doubled, showing clearly that while summer schools are a step in the right direction, public demand is for full opportunity and use of the school plant.

Furthermore, the pupils advance to higher educational levels, and fewer pupils leave school before completing the course. Being able to advance four times each year, they are rewarded for their success. Those who fail are reeducated in three-month terms, instead of five-month terms. This saves time to the pupil and reduces the cost of reeducation to the community. The retarding effect of quarantine, sickness, change of residence, and other factors that hinder pupil progress is modified, and a pupil adversely affected loses but three months instead of five, and may redeem this by attending four terms instead of three in a calendar year.

Pupils begin at any grade, but especially the first, without serious delay through failure of birthdays and school calendars to correlate. Vacations may be taken at any time convenient to families, not, as under the tra-

ditional system, merely in summer time. The loss caused by compulsory vacations is eliminated. Pupils in upper grades and high schools may be absent to assist in family support for part of each year without disastrous effect upon their further educational progress. Graduating classes four times each year provide classrooms to admit new pupils four times, and greater use of the expensive school plant is secured. Progress through the school is a fairly continuous stream, without the periodic wave fluctuations of one- and two-term systems. Frequency of reclassification tends to secure homogeneous groups, closely related in ability and in progress rate.

Continuous use of the school plant increases effectiveness twenty per cent, but grade progress is increased possibly thirty-three per cent. In practical operation, the plan has resulted in the saving of slightly less than one year in each eight years of pupil progress. With continued use, the per-pupil cost of administration, operation, and maintenance is lowered, while continued use of books, supplies, and apparatus produces economies that practically offset the increased cost of supplies.

Objections. Objection has been made that continued progress under the all-year plan forces the pupils out of social and age adjustment with their associates, particularly in high school and college. Available records show that the average ages of all-year and traditional elementary graduates differ by only three months. The all-year school's chief value lies in the conservation of the pupils who tend to drop out when retarded in traditional schools, and in the more rapid progress of normal pupils into higher educational levels. It has been feared that adverse health conditions would result from continuous school. Records of fifteen years show that four weeks of vacation with holidays and week-ends, together with the determining effect of regularity of life and habit, result in a definitely better health standard among pupils in all-year schools than in corresponding traditional schools.

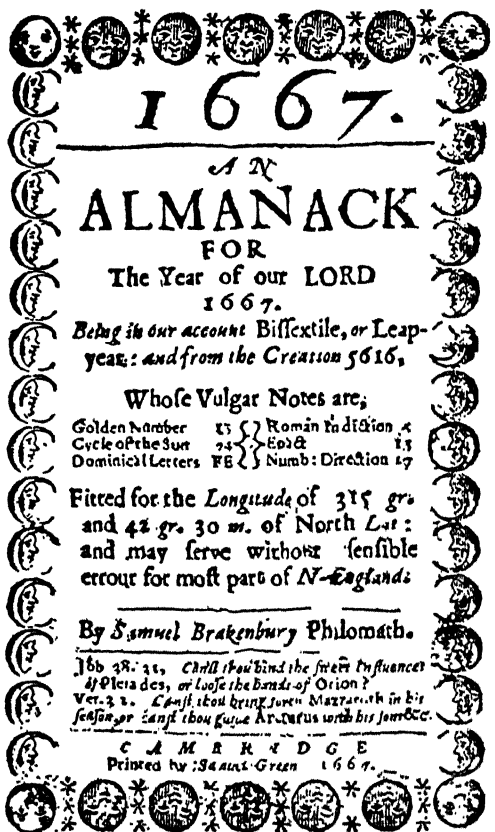
School officials have hesitated to establish all-year terms because of the cost of teachers' salaries for two additional months. The saving in school accommodation, with the increased educational opportunity, has fully offset this factor in an experience of over fifteen years. Other educators have expressed apprehension that continuous service would deter teachers from professional study and from the cultural advantages of travel. This has been solved by granting three-month furloughs every three years and at such other times as teachers' services are not required. W.A.R.

Related Subjects. In connection with the above subject, attention is directed to the article **EDUCATION**, where several modern tendencies are discussed, and to the general article **SCHOOL**.

ALMAGRO, *ahl mah' gro*, **DIEGO DE.** See **PIZARRO**, FRANCISCO.

ALMA MATER, *al' mah may' tur*, a Latin phrase meaning *fostering mother*, affectionately applied by the graduates of a school or college to the institution in which they have been educated. Thus a graduate will speak of Harvard, Michigan, Yale, Cornell, or other college or university as his *alma mater*. The term was originally applied by the Romans to Ceres, the goddess of agriculture, but it has been used in its present figurative meaning for many years. See **CERES**.

ALMANAC, *awl' ma nak*, a book or pamphlet which contains a calendar, and usually includes a variety of information. It gives interesting facts about the planets and the stars, the dates of the phases of the moon, and



ONE OF AMERICA'S EARLIEST ALMANACS

Only two copies of the 1667 Almanac are known to exist. One, in the library of the American Antiquarian Society, Worcester, Mass., was purchased for \$275. The other is in the hands of a private collector in Albany, N. Y. The illustration shows the title page.

the time of eclipses and other phenomena. Holidays and feast days are given, as well as birthdays of great men, dates of important battles, and many items of current interest. Many

almanacs include summaries of recent events in political history and statistics of area, population, agriculture, manufactures, mining, and other industries.

In addition to these general almanacs, there are many whose field is limited to special subjects, such as navigation and astronomy. One of the most famous of these is the *Almanach de Gotha* (that is, Almanac of Gotha), so called because it has been published in the German city of Gotha annually since 1764. It includes much statistical matter for all countries, but is best known for its genealogies of royal and noble families.

Almanacs were in use among the Romans in ancient times, but the oldest existing manuscript copies date from the fourteenth and fifteenth centuries. Formerly, their immense popularity was due to the mass of astrological prediction with which they were filled, and the effect of these guesses at the future was often so bad that it was frequently necessary to prohibit the publication of prophetic almanacs. In 1828 the Society for the Diffusion of Useful Knowledge, by publishing the *British Almanac*, took the lead in the production of an almanac containing genuine information, and by contrast showed the fraudulent nature of much of the material which had been furnished in the earlier almanacs. Even to the present day there are published almanacs containing astrological predictions, but they are not taken seriously. There are also almanacs the sole purpose of which is to advertise medicines.

The most famous of the popular almanacs which have been published in the United States was *Poor Richard's Almanac*, begun by Franklin in 1732 and continued for twenty-five years (see POOR RICHARD'S ALMANAC). The publication of good almanacs in America is now generally the work of religious denominations, newspapers, trades, and professions. The *Nautical Almanac and Astronomical Ephemeris*, published annually by the United States Navy Department, contains information necessary for determining at any time the absolute and relative places of the sun, moon, and planets, and of many of the fixed stars; also several different series of phenomena for the determination of longitudes and latitudes, the distances of the moon from fixed stars and from planets, and the time for the occurrence of eclipses. To this are added rules and tables for practical use in nautical astronomy, land observations, and tables of tides. It is a text-book for the navigator, and no vessel leaves the American shore without it. Similar publications are issued by the governments of the maritime nations of Europe.

ALMANACH DE GOTHA, *almana' de go' ta*. See ALMANAC.

ALMANDINE, *al' mon din*, OR **ALMANDITE**, names given to two kinds of compara-

tively inexpensive gem stones of great beauty, one a variety of garnet, red in color and transparent, the other belonging to the ruby species, and having a rich violet color. The red variety is found chiefly in Ceylon, India, Brazil, and Greenland. It is highly valued as a setting for gems, and when cut with a convex face is known as a *carbuncle*. It is also used for watch jewels. The violet almandine is found in Ceylon, Australia, Alaska, New York, and less plentifully in other parts of the United States. Coarse stones are used as abrasives. See GARNET; RUBY; PRECIOUS STONES. T.B.J.

ALMA-TADEMA, *ahl' ma tad' e ma*, Sir LAURENCE (1836-1912), a Dutch painter whose pictures are remarkable for the correctness with which they record the costumes and the spirit of the past. No other artist has so wonderfully



Photo: Brown Bros.

LAURENCE ALMA-TADEMA

Standing before a bust of himself.

reconstructed on canvas the life of ancient nations, refurbishing the homes of 2,000 years ago and peopling them with figures that live. He was born in Friesland, but lived after 1870 in England, where in 1879 he became a member of the Royal Academy. In 1899 he was knighted.

Alma-Tadema's best-known canvases include *A Reading from Homer*, a reproduction of which will be found with the article HOMER in these volumes; *The Four Seasons*, *Antony and Cleopatra*, *At the Shrine of Venus*, *The Finding of Moses*, and *An Audience at Agrippa's*.

Laurence Alma-Tadema, daughter of Sir Laurence, gained distinction as a writer. Her works include the novels *Love's Martyr* and *The Wings of Icarus*; *The Herb o' Grace*, essays; and poems and plays. In 1907-1908 she gave a course of readings in America.

ALMIGHTY DOLLAR. See MONEY (Unusual Terms Applied to Money).

ALMOND, *ah' mund*, or *al' mund*, a tree belonging to the rose family, whose fruit is a



Photo: O. R. O. G.

A ROW OF ALOES

They are growing on the graves of men who were wrecked off the coast of the Scilly Islands, near England, in 1875. It was the greatest tragedy that ever befell the little community. One hundred twenty bodies lie in this churchyard. The inset shows the flowers and seeds of the aloe.

nutritious and commercially valuable nut. The almond tree is closely related to the peach, and the two trees are much alike in appearance, except that the almond is the more symmetrical. It is less hardy than the peach, and therefore not so widely distributed. In America, few almonds are produced outside of California. In the Old World, Southern Asia and the countries along the Mediterranean are the chief regions of almond production, though the trees are grown in England for their beauty. They reach a height of twenty to thirty feet. Their beautiful pink or white flowers appear before the leaves, which are oval, pointed, and notched on the edge. The fruit has a downy outer coat enclosing a wrinkled shell, within which is the edible kernel, or seed.

There are two varieties of fruit, the sweet and the bitter. Sweet almonds, which are classed as hard-shelled, soft-shelled, and paper-

shelled, are widely used for food, as they are rich in fat. They are eaten either raw or cooked, and are also used in cakes and candies. Sugared almonds and salted almonds are popular delicacies. The kernel of both varieties contains an oil that is used in medicine and as a perfume. Bitter almonds, through chemical processes, yield the poisonous substance, prussic acid, better known chemically as hydrocyanic acid. Almond butter, a compound of bitter almonds, rosewater, white of egg, and alcohol, is a toilet article.

B.M.D.

Classification. The almond tree belongs to the family *Rosaceae*. Its botanical name is *Amygdalus communis*.

ALOE, *al' o*, the name of a genus of tropical plants, several species of which yield the valuable drug known as *aloes* (see subhead below). Though these plants belong to the lily family, they bear little resemblance in general form to any of the lilies. In height they range from a few inches to thirty feet or more, but despite these differences in size they have certain well-marked characteristics which prove their close relation. Their leaves are fleshy, thick, and lance-shaped, and generally bear sharp spines at the point and along the edges. Usually these appear to grow directly from the ground, but sometimes they are borne on a visible stem. The flower stalk shoots up from the center, and bears at its end a dense cluster



ALMOND

Branch, with flowers. (a) fruit; (b) cross-section of fruit.

of yellow or reddish flowers, which are rather tubelike in form.

In Africa there are species whose leaves yield fiber used for cordage, fishing nets, and coarse cloth. A beautiful violet color is obtained from the leaves of some species. The American aloe, or agave, is an entirely different plant (see CENTURY PLANT).

Aloes in Medicine. The fleshy leaves of several aloe plants contain bitter juices obtained by evaporation. These are the aloes of medicinal practice, the most important of the vegetable purgatives. They also have a stimulating effect on the liver and the intestines. They are obtained from plants found in the East and West Indies, India, Arabia, East Africa, the Cape of Good Hope, Italy, and several Mediterranean islands. B.M.D.

Scientific Names. The aloes belong to the family *Liliaceae*. *Aloe vera* is the source of hepatic, or Barbados, aloes; Cape aloes comes from *A. purpurascens*, *A. spicata*, and *A. arborescens*; socotrine aloes is the product of *A. Perryi*.

ALPACA, *al pah' ah*, a South American animal belonging to the same family as the camel, and of special value to man because of its thick growth of fine wool. The alpaca is



Photo: Visual Education Service
A SOUTH AMERICAN ALPACA

reared only on the high plateaus of the Andes Mountains, and thrives especially well on the heights of Chile and Peru. It is a domesticated form of the guanaco (which see). The alpaca resembles both the llama and the sheep in appearance, but is between them in size, and has a longer neck than the sheep. Like them, it is a cud-chewing animal (see RUMINANTS). Its wool is finer than that of the llama and straighter than that of the sheep. Its color varies from grayish-white to almost black.

The alpaca is shorn every year, when the silky wool has grown to be eight inches in length, and millions of pounds of wool are shipped to Europe and America. The strong, soft, elastic fiber is woven into beautiful fabrics, which, under the name *alpaca*, are made into shawls, clothing for warm weather, coat-

linings, and umbrella covers. Undoubtedly the Indians of Peru employed this fiber in the manufacture of many styles of fabric for centuries before the discovery of America. A fabric of cotton and wool, containing very little alpaca wool, and used for women's dresses, is now widely sold under the name *alpaca*. The flesh of the animal has a pleasing taste and is a wholesome food. See MOHAIR. W.N.H.

Scientific Name. The alpaca belongs to the family *Camelidae*. Its scientific name is *Lama huanacus pacos*.

ALPENA, MICH. See MICHIGAN (back of map).

ALPHA, *al' fah*, AND **OMEGA**, *o me' gah*, an expression often used to convey the idea of completeness, for the two words are the first and last letters of the Greek alphabet. They are used as a symbol of God in *Revelation* 1, 8: "I am Alpha and Omega . . . which is, and which was, and which is to come." At one time the letters were emblematic of Christianity, being engraved on the tombs of the early Christians.

In astronomy, Alpha is applied to the chief star of a constellation, and the word has a similar use in other sciences.

ALPHABET, *al' fa bet*. When this word is used to designate the series of characters used in writing a language, it means exactly what the child's "A-B-C" means, for *alpha* and *beta* are the first two letters of the Greek alphabet. As long as civilization was on a low plane and people had little communication with each other except by word of mouth, such a thing as an alphabet was unknown. Gradually, however, there arose the necessity of being able to send word to people at a distance or to record certain events, and a rude form of picture-writing came into existence. This represented words or ideas, however, and not sounds, as does the true alphabet. For instance, if a man in one village wished to send word to a man in another village that he had been attacked by a number of enemies, he might draw a rough picture of a man at a tent door—himself—being made the target of the numerous spears of other crudely drawn men. Kipling in his *Just-So Stories* has two very interesting fanciful tales called *The First Letter* and *The Making of the Alphabet*, which show the possible origin of such communication.

But such picture-writing was always likely to be misunderstood, and it gradually became clear that characters representing sounds would furnish the only sure means of communication, and would materially simplify the process of writing. So far as is known, the Phoenicians were the first to invent an alphabet, in this true sense of the term, though it is possible that they received suggestions from the cuneiform writing of the Babylonians or the hiero-

glyphics of the Egyptians. At any rate, the Greeks, when they came into contact with the Phoenicians, found the latter to possess the very useful art of writing with an alphabet, and that art they promptly borrowed. Either directly or through the Latin, all the alphabets of modern times are derived from the Greek, which was an improvement upon the Phoenician in that it had letters to represent vowel sounds, instead of the dots of which the older language made use.

Just how the earliest alphabet was made is by no means certain, though it seems probable that in part at least it was an outgrowth of the older picture-writing; that is, each letter was probably drawn at first to represent some object, the name of which began with the sound which the letter was to represent. Thus the *B*, which in Greek was *beta*, in Phoenician *beth*, undoubtedly represented a house, for *beth* was the Phoenician for *house*. Originally it was drawn in some resemblance to the end of a house (see *B*), but as it was written more rapidly and more frequently, its form changed until it became the capital *B* of to-day.

The perfect alphabet has not been invented; if it ever appears it will be found to have just as many letters as the language has sounds, and no letter will represent more than one sound. However, no alphabet would remain perfect, if perfection were achieved, for the sounds in some alphabets are changing so continually that the symbols would not for long indicate exactly the sounds which they represent.

The Spanish language is the most nearly phonetic of any modern tongue. The English alphabet is imperfect, since, in the first place, it has not a character for every sound, and, in the second place, it has letters which are superfluous, because there are other letters which represent the same sounds. Thus *a* may stand for any one of eight sounds, while *c* is unnecessary because its two sounds are represented by *k* and *s*.

An alphabet is not absolutely necessary to the writing of a language, since what is called a *syllabary* is a possible substitute. That is, every syllable, instead of every sound, has its special character, as in Chinese. It is a much more difficult method of writing, however, for the Chinese child must learn thousands of symbols instead of the twenty-six which suffice for the English child. See CUNEIFORM INSCRIPTIONS; PHOENICIA; HIEROGLYPHICS.

[The story of each letter of the English alphabet appears at the beginning of each alphabetical division in these volumes.]

ALPHA CENTAURI, *al' fah sen law' rie*. See ASTRONOMY (Distances That Defy the Imagination; The Stars and Their Names); CENTAURUS.

ALPHA HERCULIS. See STAR (How Star Distances May Be Determined).

ALPHA LEONIS. See LEO, THE LION.

ALPHA RAYS. See RADIOACTIVITY.

ALPHEUS, *al' fe us*, in mythology, a river god. See ARETHUSA.

ALPHEUS AND PENEUS, *pe' ne us*, two rivers in mythological lore. See AUGEAN STABLES; HERCULES (The Twelve Labors).

ALPS, the greatest mountain system and the most important and magnificent physical feature of Europe. Once the Alps marked the northern limit of the civilized world, but even before the Christian Era, the Romans knew the way through eight or ten of its passes. Across these passes the Roman legions poured into Gaul, which eventually became a great Roman province. Back over these same passes came foreign invaders: first Hannibal, with his Carthaginians; a few centuries later the Goths; then the armies of Charlemagne and the Holy Roman emperors; and finally Napoleon, who built a wonderful road from France into Italy for his invading hosts. See HANNIBAL; CHARLEMAGNE.

Except for the few passes known to the Romans, there was little exploration of the mountains until comparatively recent times. The Mont Cenis, from 1400 until the time of Napoleon the most traveled pass, was unknown until the eighth century, and the Saint Gothard and the Simplon were first used in the middle of the thirteenth century. In the heart of these mountains, about 1215, began the gradual formation of an independent nation, the Swiss Confederation. Here, too, and in the foothills, several great families first became powerful—the houses of Savoy, Hapsburg, and Hohenzollern, later the royal family of Italy and the imperial families of Austria and Germany.

No other mountain system in the world has been so thoroughly explored, even to the summits of its highest peaks. Not only has man made paths for himself, but he has built excellent roads and railroads. Great tunnels, the Simplon, the Saint Gothard, the Mont Cenis, and the Arlberg, carry the rails below the crest of the range. A railroad even runs inside a great mountain, the Jungfrau, almost to its summit. In the Mont Blanc range, an aerial cableway three and one-half miles long carries passengers from a point 3,250 feet above sea level to the Aiguille du Midi, 9,100 feet higher. Every point of scenic or historic interest now has its inns and hotels, and the pedestrian with a knapsack on his back is cared for in countless chalets.

At all seasons the Alps are now a great playground, in which nature presents a beautiful picture on every hand. Nowhere are more magnificent contrasts in scenery.

Standing on the shores of a little lake, sur-



ALPINE FARM, NEAR THE ETERNAL SNOWS



Photo: Wide World

A SHARP PROJECTION OF THE ALPS

The mountain climber appears to be near the top, but he has yet a hard and rugged road to travel.

rounded by pretty Swiss *châlets* and farms, the visitor may gaze upward 10,000 or 12,000 feet to the snowy summit of the Jungfrau or Mont Blanc. From the summit of such a peak, or even from many lower points, there is an endless vista of mountains, with here and there a green field or a village; men and their homes seem minute specks, clinging to the sides of rocky precipices or huddled in narrow valleys.

Of the entire 90,000 square miles covered by the Alps (an area larger than Ohio and Pennsylvania), one-fourth is barren—rock, ice, snow, and water; another fourth is available for farms and vineyards; and a half is pasture land and forest. In the summer, the herds roam high on the mountain-side, and they are often seen only a few hundred feet from the snowy source of some stream. In the lower regions, the plant and animal life is not different from that of the rest of Europe, but above the timber line there are a few animals and plants which belong distinctively to the Alps. There are the chamois and the steinbock, or mountain goat, which haunt the inaccessible rocks of the higher altitudes, and there is the famous flower, the *edelweiss* (which see), as well as the Alpine rose and violet.

Precious stones abound in the central ranges, while gold, silver, lead, and copper are mined, especially in the eastern mountains.

Detailed Description. The Alps form a some-

what irregular crescent in Southern Europe, with its horns near Nice, on the Mediterranean, and Trieste, on the Adriatic. The mountains reach almost to the seashore at both ends, thus shutting off Italy from the rest of Europe. They cover an area of 90,000 square miles; almost all of Switzerland and parts of Northern Italy, Southeastern France, Southern Germany, Western Austria, and Northern Yugoslavia. The Alps have a length of 650 miles in a general east-and-west direction, and a width of 75 to 160 miles.

From the principal chains, spurs extend to the Apennines, the Vosges, the Harz, and the Carpathians. Most of the so-called Alpine region has an average altitude of 6,000 to 8,000 feet, but there are hundreds of peaks exceeding 10,000 feet. Mont Blanc, the loftiest, Monte Rosa, the second highest, the Matterhorn, another giant, and the Jungfrau, perhaps the most beautiful of them all, are described in separate articles. The summits of these peaks and many others are covered with an everlasting mantle of snow and ice. From them there descend to the valleys below great glaciers, enormous masses of partly melted snow and crushed ice, which acquire a force that nothing can resist (see **AVAILANCE**). The Mer de Glace, on the northern slope of Mont Blanc, is fifteen miles long and three miles wide, and the Aletsch glacier, the largest in the Alps, is sixteen miles long. The Rhone glacier, the source of the river Rhone, is one of the most famous.

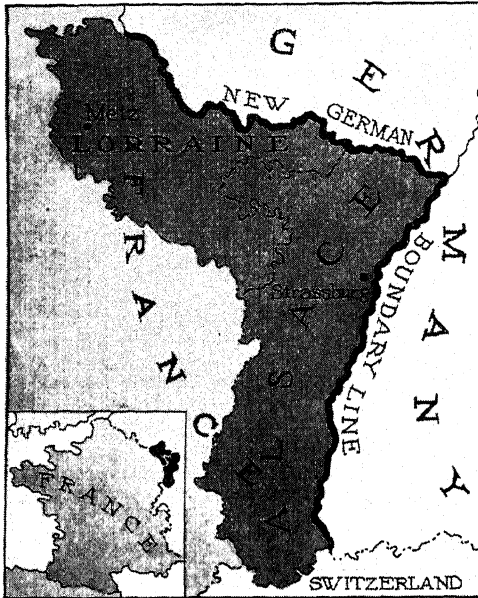
Several of the great European rivers rise in the Alps, including the Drave, a tributary of the Danube; the Po, the Rhine, and the Rhone. Among important lakes in or near the Alps

Outline on the Alps

1. Size
 - (a) Area, 90,000 square miles
 - (b) Length, 650 miles from east to west
 - (c) Breadth, 75 to 160 miles
 - (d) Average altitude, 6,000 to 8,000 feet
 - (e) Loftiest peaks
2. Location
 - (a) Occupying Switzerland and part of Italy, France, Germany, and Austria
3. Physical features and scenery
 - (a) Precipices
 - (b) Glaciers
 - (c) Farms and *châlets*
 - (d) Lakes and rivers
 - (e) Plant and animal life
4. Exploration and improvements
 - (a) Thoroughly explored
 - (b) Hotels and railroads
5. Historic interest
 - (a) Early boundary of the civilized world
 - (b) Crossed by invaders and conquerors
 - (c) Rise of two imperial houses of Europe in small Alpine kingdoms

are Como, Constance, Garda, Geneva, Lugano, Maggiore, Lucerne, Neuchâtel, and Zurich. (The above rivers and lakes are nearly all described in their places in these volumes.)

ALSACE-LORRAINE, *al sahs' - lo rane'*, a region without real political significance since 1919, when, after being possessed by Germany as a territory of the entire empire for fifty years,



ALSACE-LORRAINE

Small map shows size as compared with the rest of France.

it was returned to France, from which country Germany had taken it at the conclusion of the Franco-German War in 1871. Alsace-Lorraine now forms the three departments (provinces) of Bas-Rhin (Strassburg), Haut-Rhin (Colmar), and Moselle (Metz). They are governed as are the other departments of France.

Alsace-Lorraine has a total area of 5,605 square miles, slightly larger than Connecticut. It lies on the east of France, with Switzerland on the south, Luxemburg on the north, and the Rhine River (separating it from Germany) on the east. At the narrowest point of Alsace, the distance from the Rhine to the old French boundary is only twenty-two miles. The district is roughly shaped like an inverted L, Lorraine being the base and Alsace the vertical arm.

Most of Alsace-Lorraine is a plain, which becomes slightly lower as it approaches the Rhine. Half of it is occupied by farms, wheat, rye, barley, and oats being important crops. Grapes are also raised extensively, and the white wines of Alsace and the red wines of Lorraine are famous. The western part lies mostly

in the Vosges Mountains. Here iron, coal, and salt are mined in considerable quantities. Many of the simple manufactures, especially the home-made clothing industry, are still carried on in the homes of the workmen. The weaving of cotton is most important, followed by that of woollens, silks, and linens. The iron and steel industry ranks second to the textile industry. For further description, see FRANCE.

Historic Importance. Originally this region was the home of Celtic tribes, but in the fourth and fifth centuries it was overrun by the Teutonic tribes, who laid the foundations for the empire of Charlemagne. When Charlemagne's empire was divided among his grandsons, it became a part of Germany, and so it remained until the sixteenth century. In 1552 Henry II of France took Metz, Toul, and Verdun, and in 1648, by the Peace of Westphalia, the Holy Roman emperors ceded more lands in Alsace to France. Louis XIV, however, was not satisfied, and in 1680 and 1681, in times of peace, he seized the imperial free cities of Strassburg and Colmar.

For a century the inhabitants resisted all efforts to turn them into Frenchmen, but with the French Revolution came a great change. The Alsatians, especially, were roused to a frenzy, and no more violent advocates of "liberty, equality, and fraternity" existed anywhere. So completely did Alsace then become French in spirit that in 1871 it preferred to remain so, and about 50,000 Alsatians moved across the new border into France rather than swear allegiance to the German emperor.

In the World War. After 1871, when Alsace-Lorraine became a part of the German Empire, there persisted a feeling, both in France and Germany, that France would some day attempt to retake "the lost provinces." This feeling was always a factor in the relations between the two nations, and was one of the remote causes leading to the World War in 1914. Within a week after the war began, sentimental and semi-political reasons dictated a French offensive against both provinces. From a military point of view the invasion failed, because the French were soon driven back beyond the border, except in the extreme south, but it was successful in arousing the patriotism of the French and in stimulating their desire to reconquer the provinces. The strategy of the war, however, required the concentration of the French strength in the north of France, and after the first weeks no further invasion on a large scale was attempted in Alsace or Lorraine. For further details of military operations, see WORLD WAR.

ALSIKE, *al' sik*. See CLOVER (Kinds).

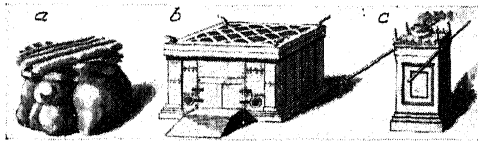
ALTAI, *al' ti*, **MOUNTAINS**, the name of a lofty mountain system, immensely rich in gold, silver, copper, and iron; geologically they are

among the oldest mountains in Asia. They lie partly in Russian and partly in Chinese territory, on the borders of Siberia and Mongolia. The Ob, Irtysh, and Yenesei rivers rise on the north side of the range. Their lower slopes are covered with verdure, and the forests of the higher elevations extend nearly to the rounded summits, the highest of these being Byelukha, or White Mountain (11,000 feet). Mining is an important industry in the Russian provinces traversed by this range.

ALTAIR, a star which gives ten times as much light as the sun. See **ASTRONOMY** (The Stars and Their Names).

ALTAMAHA, *awl ta mah har'*, **RIVER**. See **GEORGIA** (Rivers).

ALTAR, *awl' tur*. Originally, an altar was a high place, such as a mound of turf, a flat-topped rock, or some other elevated object, upon which sacrifices could be performed or



FORMS OF ANCIENT ALTARS

(a) In the time of Abraham; (b) altar of burnt-offering; (c) altar of incense.

offerings laid. Altars have been used by nearly all races and from the earliest times, because the idea of winning the favor of the gods, or of turning away their wrath by offering sacrifices and bringing gifts to the altar, has had a very important place in the religions of mankind.

In the course of time, altars became more elaborate. The Babylonians built them of sun-dried bricks; the Assyrians, of limestone and alabaster; the Egyptians, of richly carved stone. The altars of the Hebrews, from the one that Noah "built unto the Lord" after the Flood, to the magnificent gold-covered altar of incense in the Temple at Jerusalem, were a most intimate part of their worship. The altar among the Romans developed from a simple mound of earth or a heap of stone to the great Altar of Peace, built in honor of Augustus, and a masterpiece of art; the Greeks and Romans reared magnificent altars in honor of their more important gods.

In the Christian Era. When the early Christians began to build their churches, they tried to have their altars as different as possible from those of the pagan Romans. Only one was permitted in each church, and the oblong shape was finally adopted. Beneath the altar was a small chapel used for the relics of the martyrs and saints, called the confession. It later became the crypt (see **CRYPT**). As early as the fifth century the altars were being adorned with

precious stones, and those in the great cathedrals were often very elaborate. In the Middle Ages there came into use the altarpiece, a decoration placed at the top of the altar and at the back, and these were sometimes beautified by master sculptors, painters, and carvers.

At the present time, the altar is quite plain in those churches which have the more simple forms of worship. In many Protestant churches there is no real altar, but the rail in front of the pulpit where the worshipers kneel to receive the sacrament of the Lord's Supper is sometimes given that name. It is in the Roman Catholic and Episcopal churches, where elaborate ceremonies have been retained, that the only stately and very beautiful altars of modern times may be seen.

Derivation. The word *altar* is from the Latin *altus*, and means *high*.

ALTERNATING CURRENT. See **DYNAMO**; **CURRENT**, **ELECTRIC**; **ELECTRICITY**.

ALTERNATION OF GENERATIONS. See **FERNS**.

ALTERNATORS. See **DYNAMO**, subhead.

ALTHING, *ahl' thing*, the legislative body of Iceland (which see).

ALTIMETER, *al tim' e tur*. See **AIRCRAFT** (List of Aeronautical Terms).

ALTO ADIGE, *ahl' toh ah' de jay*. See **TYROL**.

ALTON, **ILL.** See **ILLINOIS** (back of map).

ALTONA, *ahl' toh' nah*. See **GERMANY** (Principal Cities).

ALTOONA, *al too' nah*, **PA.**, is distinctly a railroad city, having within its limits the great shops of the Pennsylvania Railroad Company, said to be the largest in the world. It is situated in Blair County, southwest of the geographical center of the state, 117 miles east of Pittsburgh, 132 miles northwest of Harrisburg, and 237 miles northwest of Philadelphia. Population, 1928, 73,458 (Federal estimate).

Altoona lies at the eastern base of the Allegheny Mountains, 1,180 feet above sea level, in a district noted for its mountain scenery. Here westbound trains begin to ascend the mountains in a serpentine route by a grade of ninety feet to the mile. At a distance of five miles, near the top, the route winds in a graceful curve around the mountains, forming the famous Horseshoe Curve. This is the highest elevation traversed by the Pennsylvania Lines. (See page 5466).

In 1849 the Pennsylvania Railroad Company selected the site of Altoona for its principal workshops. The new railroad town was named for Altona, Denmark, where the first railroad shop in the world was built, the extra *o* being added to establish the individuality of the American settlement. The town was incorporated as a borough in 1854, and as a city in 1868.

Transportation. Altoona is well served by the Pennsylvania Railroad, about 100 passenger trains being operated daily to and from the city. Interurban and motorbus lines extend to cities and towns north and south.

Industry. The dominating industry lies in the Pennsylvania Railroad Company's great shops. Steam and electric locomotives, freight and passenger cars, and a great variety of equipment are made here. So extensive are the railroad interests in Altoona that the Pennsylvania Railroad has coöperated with the public schools to establish a railway high school, with full equipment of forge, foundry, and woodworking machinery. The city is also the business center for an agricultural region, and has manufactories of silk, trucks, garments, brick, mattresses, confectionery, food products, printing products, and bar iron. Immense coal deposits are found in the locality, and coal mining is an important industry. D. J. H.

ALTO-RILIEVO, *ahl' to re lya' vo* (high relief), is the term applied to sculpture when the figures stand out more than one-half their thickness from the background without being entirely detached. On the so-called *metopes*, or slabs of marble which topped the columns of the Parthenon (which see), there are some wonderful examples of figures in high relief. The sculptures at the sides of the base of the Nelson Monument in Trafalgar Square, London, are also sculptured in this manner. Lorado Taft's *Solitude of the Soul* is a modern example of this type of sculpture. See **BAS-RELIEF**; **MEZZO-RILIEVO**.



ALTO-RILIEVO
Detail from the Capitol Building and Loan Association, Topeka, Kan. The sculpture is by Emil R. Zettler.

ALTRUISM, *al' tru iz'm*, a word which means literally *otherism*, or thoughtfulness for others above self, and stands for the belief that the individual should subordinate his personal feelings and sacrifice himself to the welfare of society. The word was coined from the Latin word *alter*, meaning *other*, by the French philosopher Comte, who worked out the theory itself. It is the opposite of *egoism*, which makes self-benefit always the motive for conduct.

Pure altruism is impossible, because everyone who has tested the theory in any degree has learned that the individual secures his own happiness in the happiness of others. The truly charitable person, who sacrifices himself that he may make others happy, attains in the end greater happiness than the selfish man, and thus to that extent may be reckoned an egoist.

While there still remains an occasional philosopher who holds that self-assertion or self-development should be the main principle of life, society as a whole realizes that there can be no real progress unless each person has due regard for the interests of his fellowmen. See **CHARACTER TRAINING** (Unselfishness is Fundamental).

AL'UM, a name commonly applied to various double salts containing aluminum, which are used in the arts, in industry, and in medicine. The alum usually found in the home medicine cabinet is *potash alum*, a sulphate (sulphuric-acid salt) of aluminum and potassium. Other commercial alums include those containing *ammonium* and *sodium*. Most of the alums found on American markets are manufactured from bauxite, the source of aluminum sulphate. The ammonium sulphate is a by-product in the manufacture of illuminating gas.

Medicinally, potash alum is used externally as an astringent, to stop bleeding, as a remedy for canker sores, ulcer, and sore throat (applied by swabbing), and in water solution to check excessive perspiration. It has the property of drawing tissues together. Given internally in water, in five-grain doses, it serves as an antidote for lead poisoning. The various alums are employed in dyeing and tanning, in paper sizing, in hardening plaster of Paris, for purifying water, in deodorizing mineral oils, and as bases in cheap baking powders. Though there has been some legislation against the use of alum in baking powder, the United States Department of Agriculture has stated that it can be used in small quantities for this purpose without harmful effects.

ALUMINA, *a lu' mi nah*, the oxide of aluminum. Bauxite and corundum are natural forms of alumina; emery is a dark-colored, granular variety of corundum, containing an admixture of magnetite and other minerals. Rubies, sapphires, and Oriental amethysts are specimens of alumina with traces of metallic oxide. Rubies and sapphires have been successfully made from molten alumina. Alundum is an artificial form of alumina manufactured from bauxite, and is used as an abrasive (which see). The presence of alumina in porcelain clays and kaolins makes them valuable for pottery manufacture. The oxide is also employed in the dyeing industry. T. B. J.

Chemical Formula. The formula of alumina is Al_2O_3 ; that is, a molecule of alumina consists of two atoms of aluminum and three atoms of oxygen.

ALUMINUM, *a lu' min um*, OR **ALUMINIUM**, *al yu min' i um*, the most abundant metal and the lightest in common use. Over seven per cent of the earth's crust is composed of aluminum; only oxygen and silicon among the elements are found in greater amount. Aluminum is present in feldspar, mica, and many other silicate rocks and minerals, in all

soils, and in clay, but for commercial production it is extracted successfully from only two minerals—bauxite and cryolite. In the preparation of metallic aluminum, cryolite is used as a solvent for bauxite (see subhead on *Manufacture*, below). Large deposits of bauxite are found in Arkansas, but the United States imports a great deal from British and Dutch Guiana in order to conserve the domestic supply.

Properties. Aluminum is a metallic element, with the symbol *Al*. It is a whitish substance, a little harder than tin, which it resembles, about two and one-half times as heavy as water, but only one-third as heavy as iron. In tensile strength it excels all the other metals except iron and copper, and it can be hammered into sheets when heated to about 100° C. (212° F.). Alloyed with one per cent each of nickel and copper, aluminum easily can be drawn into wire. Only silver, copper, and gold, among metals, excel it as a conductor of heat and electricity. It does not rust easily, but is corroded by salt water.

Uses. Since the perfection of a successful method of producing metallic aluminum, the uses of the metal have steadily increased until they number more than two hundred. Because of its lightness and strength, aluminum and its alloys are employed in enormous quantities in the manufacture of automobiles and airplanes. The metal is one of the best possible materials for cooking utensils, since it is light and durable, does not rust like tinware nor chip like granite, and is not easily acted upon by vegetable acids. Because of its electrical conductivity, aluminum has been used in place of copper for high-tension electric wires. The top of Washington Monument is covered by a thin sheet of aluminum, which is connected with a lightning rod. Another important use of aluminum is in the manufacture of steel; the addition of an almost imperceptible amount eliminates air holes and makes the steel solid. Aluminum can be powdered when heated to a temperature of about 650° C., and is then mixed with oils to make paint. Thermite, a mixture of powdered aluminum and iron oxide, is used in welding. Motion-picture films containing aluminum are proving less dangerous and more durable than those containing cellulose, besides being cheaper. More familiar aluminum products include hairpins, thimbles, combs, mirror frames, wrapping foil, and various novelties useful or ornamental.

The many alloys of aluminum include magnalium, which contains magnesium and is harder than aluminum; aluminum bronze, which is ninety per cent copper and is stronger than ordinary bronze; duralumin, an alloy of aluminum with copper, manganese, and magnesium; and nickeloxy, an alloy of aluminum

with small amounts of nickel and copper, which gives very strong, light castings.

Manufacture. So varied are the uses of aluminum that it seems as if man must have been aware of its existence for ages; yet it was unknown before the beginning of the nineteenth century, and it has not, in any part of the world, been found in a pure form. As a constituent of clay, it had a place in one of the oldest human industries, that of pottery making. Yet it was not produced chemically until 1854, and was of no practical value until the last decade of the nineteenth century, after a new process was discovered for its reduction by electrolysis.

In this method, known in America as the Hall process and in Europe as the Heroult process, aluminum ore in the form of bauxite is mixed with a readily fusible mineral called cryolite. An electric current is passed through the mixture. The poorly conducting mixture soon becomes hot enough to melt the cryolite. The bauxite dissolves in the molten cryolite, and is decomposed by the current. Molten aluminum is set free at the negative electrode, and runs down to the bottom of the crucible, whence it is drawn off through a tap-hole. At the positive electrode oxygen is set free. The operation is carried on in a furnace which is practically a huge crucible made of blocks of carbon. The positive electrode is composed of heavy carbon plates or cylinders. This is attached to a chain and a derrick in such a way that it can be lowered into the crucible as fast as the end is burned off by the liberated, or nascent, oxygen (see HYDROGEN PEROXIDE). The carbon-lined crucible is itself the negative electrode. The bauxite is fed into the crucible as fast as it is reduced, and the process continues until the carbon electrode has been entirely consumed. An ordinary furnace will produce about 400 pounds in twenty-four hours. T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Alloy	Ductility
Bauxite	Duralumin
Copper	Electrolysis
Cryolite	Malleability

ALUMINUM BRONZE. See BRONZE.

ALUNDUM. See ALUMINA.

AL'VA, OR AL'BA, FERDINAND ALVAREZ DE TOLEDO, Duke of (1508-1582), a Spanish general and statesman whose name became a synonym for cruelty and tyranny. Under Charles V and Philip II he fought in the armies of Spain, winning some distinction, but his real part in history did not begin until he was sent in 1567 as governor to the Netherlands. Philip II had given him authority to reduce the country to order, and thorough indeed were his methods. He ordered before his "Council of Blood" all who presumed to question his deeds, and all who had property

which he coveted, and their condemnation was sure and speedy; he made life in the Netherlands so unendurable that many people of prominence emigrated to England. But his tyranny worked its own defeat, for Holland and Zealand rose against him, his fleet was destroyed, and he was recalled to Spain at his own request. In Spain he was given a genuine ovation, and later he confirmed himself in the good graces of his king by defeating the Portuguese in a decisive campaign.

ALVARADO, *ahl va rah' doh*, PEDRO DE (about 1499-1541), one of the early Spaniards in America, in search of gold and adventure, whom circumstances made the conqueror of Guatemala. He was born at Badajoz, Spain, and in his youth began a more or less exciting career in the New World. He was the companion of Cortez in the latter's conquest of Mexico (1519-1521), and in 1523 was ordered to subdue the tribes of Guatemala. On the completion of this task, he returned to Spain, to receive from Charles V the appointment of governor of Guatemala. Later he made a dash across the Andes Mountains with a force of 500 soldiers to conquer Quito, but found Pizarro and Almagro ahead of him in that field. In 1537 Alvarado was made governor of Honduras. In 1541 he was crushed under his fallen horse during a fight with the Indians.

ALVEOLA, *al ve' o lah*, singular form of *alveoli*. See **TEETH**.

ALVERSTONE, LORD (formerly SIR RICHARD WEBSTER, 1842-1915), a distinguished English jurist, who served first as attorney-general of the United Kingdom, then as Lord Chief Justice (1900-1915). He acted for Great Britain in the Bering Sea arbitration of 1893, and in the boundary dispute between British Guiana and Venezuela in 1898. Five years later Lord Alverstone was president of the commission chosen to settle the boundary dispute between Alaska and Canada, and he cast his vote in favor of the United States, securing for that country control of the Alaskan Pacific Coast. See **ALASKA** (History).

ALYSSUM, *a lis' um*, **SWEET**. See **SWEET ALYSSUM**.

AMADEO, *ah mah du' o*, GIOVANNI ANTONIO (1447-1522), an Italian, known also as **OMODEO**, one of the great artistic figures of the Renaissance, who left the impress of his genius upon architecture and sculpture. He had a part in the decoration of the Certosa (a monastery) at Pavia, the façade of which was his greatest work; another of his notable productions was the decorative art he applied to the Colleoni Chapel at Bergamo, on which he was engaged for five years; the cathedral at Cremona was beautified by his sculptures, and to his art is due the light and graceful Gothic spire of the Cathedral of Milan, the crowning feature of that architectural marvel.

AM'ADIS OF GAUL, the central figure of the most famous legends of medieval times. In what country they originated, and when, is not known, but their nativity was claimed by Spain, Portugal, and France between the years 1250 and 1370. The earliest of the legends of which copies yet exist was printed at Saragossa in 1508, but there is reason for the belief that a prior edition appeared in Seville in 1496. As various authors addressed themselves to the legends, other members of the Amadis family were introduced, and volumes eventually appeared to the number of about twelve.

The romances are a record of fanciful and weird occurrences, with settings ranging from Turkey to Scotland; the books are filled with references to secret and magic chambers, ghosts, enchanters, and heroic actions in an amazing array. Cervantes wrote *Don Quixote* to ridicule the Amadis tales, yet he gave testimony to their quality as the best books of the kind that were ever written. See **DON QUIXOTE**.

AMALEKITES, *am' a lek ites*, a wandering tribe of Arabs with whom the Israelites came into fierce conflict, both during their years in the Wilderness (*Exodus* xvii, 8-16), and after their settlement in Canaan, from the sixteenth to the seventh century B.C. No tribe was more bitterly hated by the Israelites, who determined to exterminate it. Saul almost succeeded in doing this (*I Samuel* xv, 2), but there remained a strong and desperate band, against whom David later fought successfully (*I Samuel* xxx, 1-20). In the days of Hezekiah, the utter destruction of the Amalekites was finally achieved (*I Chronicles* iv, 43).

AMALFI, *amah' fe*. See **ITALY** (The Cities).

AMALGAM, *a mal' gam*. When mercury is brought into contact with some other metal, what is known as an *amalgam* is formed. Iron and platinum do not unite with mercury. In mining operations mercury is used to extract free gold and silver from their ores. Tin amalgam was formerly used for silvering mirrors, but real silver is now used except for mirrors of very cheap grade. To fill the cavities in decaying teeth, dentists mix mercury with alloys of silver and other metals. In the tooth, the soft amalgam soon sets to a hard, durable filling. The zinc plates of electric batteries are sometimes "amalgamated" by rubbing the surface with mercury. This prevents the zinc from dissolving in the battery liquids when the cells are not in use. T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Alloy	Mercury
Gold	Metallurgy (Amalgamation)

AMALTHEA, *am al the' uh*. See **AURIGA**; **CAPRICORNUS**.

AMANA, *a mah' nah*, a religious society founded in Germany in 1714 by Eberhard Gruber, and now centered at Amana, Ia.,

a community of seven villages twenty-eight miles west of Iowa City. The members came to the United States in 1843, began the settlement in Iowa in 1855, and the society was incorporated under its present name in 1859.

The community is directed by a president and a board of thirteen, each village having its own board of elders. Though family life is maintained, meals are prepared and served in "kitchen-houses," and the society as a whole carries on manufacturing, agriculture, and other work. There are about 1,800 persons in the community, and they own about 26,000 acres of land. All of these people dress plainly and in sober colors; their confession of faith is founded on the revealed Word of God.

[Amana is the name of a mountain mentioned in *Song of Solomon* iv, 8, and means *true*, or *fixed*.]

AMANITA, *am a ni' tah*. See MUSHROOMS.

AMARANTH, *am' a ranth*, a word which means *unfading*, is the common name of a family of plants of varied and interesting habits. Some of the amarantths are common weeds, and others are familiar garden flowers. Among the former are the troublesome coarse-leaved *pigweed* and a weed commonly called *tumbleweed*. *Love-lies-bleeding* is a garden species with long, drooping flower stems and crimson flowers surrounded by dry red bracts. These latter remain fresh a long time after the flower's mortality. This amaranth characteristic has given to the English language, in fact, the adjective *amaranthine* (*undying*). Wordsworth speaks of "the amaranthine flower of faith." Another well-known species, *prince's feather*, is a tall plant with pinkish-purple flowers in thick, terminal clusters. The plant is aptly named. Blooming late in the season, the flower spikes of prince's feather resemble royal plumes waving in the autumn breeze. Also seen in gardens is the variegated *cockscornb*. B.M.D.

Scientific Names. The scientific name of the amaranth family is *Amaranthaceae*. *Love-lies-bleeding* and *prince's feather* are, respectively, *Amaranthus caudatus* and *A. hypochondriacus*. Other important genera are *Celosia* and *Gomphrena*. *Gomphrena globosa* produces so-called *everlasting flowers*.

Related Subjects. The reader is referred in these volumes to the following articles:

Cockscornb	Pigweed
Everlasting Flower	Tumbleweed

AMARILLO, *am ar il' o*, TEX. See TEXAS (back of map).

AMARYLLIS, *am a ril' is*, **FAMILY**, lily-like plants, of which one species was formerly supposed to be the Biblical "lily of the field," which "toils not, neither does it spin." In general, the members of the amaryllis family spring from bulbs and bear beautiful, highly colored flowers, many of which are cultivated in gardens and hothouses. The *snowdrop*,

the *daffodil*, and the *narcissus* are everywhere familiar, and the century plant grows profusely in warm climates. The bulb of a certain South African species known as the *blood-flower* is



BELONGING TO THE
AMARYLLIS FAMILY

(a) Belladonna lily; (b) narcissus; (c) star grass. Below, an enlargement.



so poisonous that the Hottentots use the juice to anoint their deadly arrowheads; the bulb of the common narcissus is strongly emetic. The most valuable member of the family com-

mercially is the agave, or century plant. The scientific name of the amaryllis family is *Amaryllidaceae*. B.M.D.

Related Subjects. The following species of *Amaryllidaceae* are treated elsewhere in these volumes under their own titles:

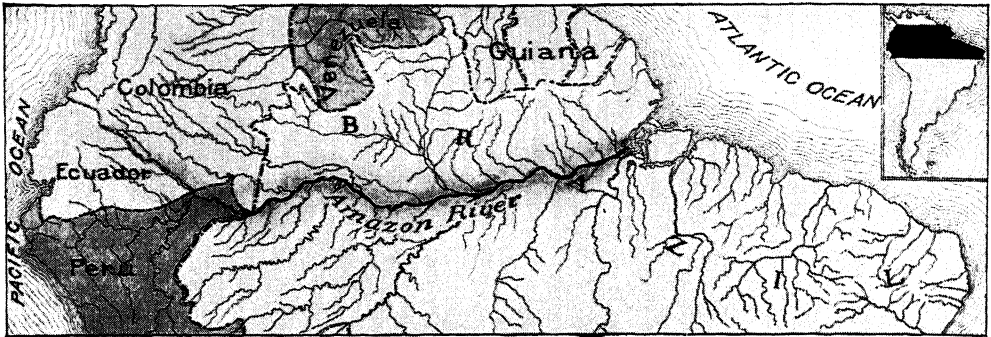
Century Plant	Narcissus
Daffodil	Snowdrop

AMATHIS, *ah' mah this*. See DARDANELLES (In Myth and Story).

AMATI, *ah mah' tee*, a famous Italian family of violin-makers, of which Andrea Amati (1530-1611) was the founder. His two sons Antonio (1550-1635) and Girolamo (1556-1630) enhanced the fame of the family; then came Nicolo (1596-1684), son of Girolamo, who became the most eminent of the group. The instruments he made excelled those of his predecessors in power of tone. The greatest among many pupils of Nicolo was Antonio Stradivarius (which see). See, also, VIOLIN.

AM'ATOL. See EXPLOSIVES; AMMUNITION (Explosives).

AMAZON, *am' a zon*, **RIVER**, the greatest river of South America, and with its tributaries the largest river system in the world. The origin of the name is uncertain, but it is usually credited to one of the early Spanish explorers, whose party was attacked by a band of natives, including many women, suggesting the name of the warlike women of



THE COURSE OF THE MIGHTY AMAZON

Some of its tributaries are among the great streams of the world. The smaller map, in its black portion, indicates the part of South America which appears in the larger space.

Greek mythology (see **AMAZONS**). The Amazon is the only great river in the world whose general direction is east and west, all others being north and south. The total length of the main river is 3,300 miles, about 100 miles longer than the distance from New York to San Francisco, and its drainage basin has a total area of 2,500,000 square miles, equal to five-sixths of the United States. The river is navigable for ocean steamers as far as Iquitos, 2,300 miles from the Atlantic, and up to this point it has an average depth of 120 to 150 feet during the rainy season. For nearly 500 miles beyond Iquitos, it is navigable for steamers drawing no more than fourteen feet of water, and smaller vessels have ascended even higher. The total length of navigable rivers in the system is about 15,000 miles.

The Amazon is formed by the junction of two main branches, the Marañon and the Ucayali. The Marañon, which rises in the Andes only sixty miles from the Pacific Ocean, has its source farther west than the Ucayali, but the latter, being larger, is usually called the chief branch. In its long course the Amazon receives over 200 tributaries, the most important of which are treated elsewhere in these volumes.

Much of the Amazon is really a great basin rather than a river, and the lower section was once a gulf of the ocean. After it leaves the Andes, there is a scarcely perceptible fall. Where it leaves Peru and enters Brazil it is already a mile wide, but is only 300 feet above the level of the Atlantic, and in the last 400 miles its average fall is only one-eighth of an inch per mile. Yet so enormous is the mass of water which the river receives from its tributaries that it flows at the rate of two and one-half to three miles an hour and discharges at its mouth between 4,000,000 and 5,000,000 cubic feet of water per second. In a single day this discharge would make a lake twenty-five miles long and four to five miles wide, with a uniform depth of 100 feet.

Throughout most of its course the banks of the Amazon are little higher than the stream. In the rainy season the river floods the lowlands, sometimes covering several hundred thousand square miles. Though the true course of the river is from four to six miles wide, there are numerous side channels, which it is possible to ascend for hundreds of miles without even entering the main channel.

As the mouth of the stream is approached, the river widens gradually, until, at its mouth, it reaches a maximum of 207 miles. Lying in the mouth is the island of Marajo, or Joannes, which is larger than the combined areas of Massachusetts, Connecticut, and Rhode Island, and is about equal in size to the kingdom of Denmark. The river current is noticeable in the ocean 200 miles from shore because of the discolored water, and at high tide the current is reversed for 400 miles inland. The inrush of the tide is so great that it frequently creates a *bore*, a wall of water from twelve to twenty-five feet high.

Related Subjects. For the plant and animal life of the Amazon basin, and the character of the commerce carried on the river, see **BRAZIL**. The reader is also referred in these volumes to the following articles:

Bore	Marajo
Madeira River	Rio Negro
Manaos (Brazil: Cities)	Tapajos River

AMAZONS, a race of warlike women who, according to ancient Greek tradition, either permitted no men to reside among them, or kept them in a state of slavery. They are generally supposed to have inhabited the region on the banks of the river Thermodon, in Asia Minor. The most notable city established by them was Ephesus, where they built magnificent temples for the worship of Ares (Mars) and Artemis (Diana). The Amazons were defeated by Hercules, who sought the girdle of their queen, Hippolyta; later, when leading their armies to the help of Troy, the Amazonian queen was slain by Achilles. The race was finally exterminated by Theseus and



THE AMAZON

A bronze in the National Gallery, Berlin. Louis Quailon, sculptor.

the Athenians. It is said that the Amazons burned off their right breasts that they might not impede them in the use of the bow; old sculptures, however, do not show such mutilation. In Greek art they are usually represented as riding on horseback, carrying a lance, bow, or battle axe, and a shield.

Related Subjects. The reader is referred in these volumes to the following articles:

Diana Hercules Mars Theseus

AMBAS'SADOR, a diplomatic officer of the highest rank, employed by one country at the court or capital of another. He is entrusted with the proper development of those matters which affect the governmental relations—political relations—of the two countries. In this respect, diplomatic officers of all grades differ from consuls, who are appointed to develop trade relations only (see **CONSUL**).

An ambassador of the highest rank, who is appointed to a great nation, is termed *ambassador extraordinary and plenipotentiary*. To a country of lesser rank, yet of ambassadorial dignity, is accredited an *envoy extraordinary and minister plenipotentiary*. A nation of still lower rank sends and receives a *minister resident*; this is the lowest chief office in the diplomatic service. The American republic sends sixty-two diplomatic representatives of all grades to the nations of the world.

Until 1896 the United States sent no ambassadors to foreign countries, but was represented by *ministers plenipotentiary*. In that year the ministers to Germany, France, England, and Italy were raised to the rank of am-

bassadors extraordinary and plenipotentiary, in recognition of similar action upon the part of those governments, and since then the post of minister plenipotentiary has been raised to ambassador for Argentina, Belgium, Brazil, Japan, Mexico, Peru, Russia (no relations since 1917), Spain, and Turkey.

The United States pays the ambassadors it sends to foreign courts \$17,500 per year, but does not, as a rule, furnish them residences or offices abroad or make an appropriation for such expenses. However, by gift of J. P. Morgan, the United States owns its embassy building in London. A movement is under way to provide a government-owned building in Paris for the American embassy. A number of European ambassadors to the United States live in fine residences owned by their governments, and receive salaries ranging from \$20,000 upwards, \$25,000 salary and \$50,000 for expenses being given the British ambassador to the United States. See **DIPLOMACY**.

AMBER. As the pine trees of to-day secrete a sticky, yellowish resin, so did those of thousands and hundreds of thousands of years ago, and when those trees were buried under the ground or under water, during the great changes which took place in the earth's surface, the lumps of resin gradually hardened or fossilized into the beautiful substance which is known as amber. To-day these irregularly shaped lumps, which occasionally reach a size of from ten to fifteen pounds but which are generally much smaller, are dug up from the shores of the

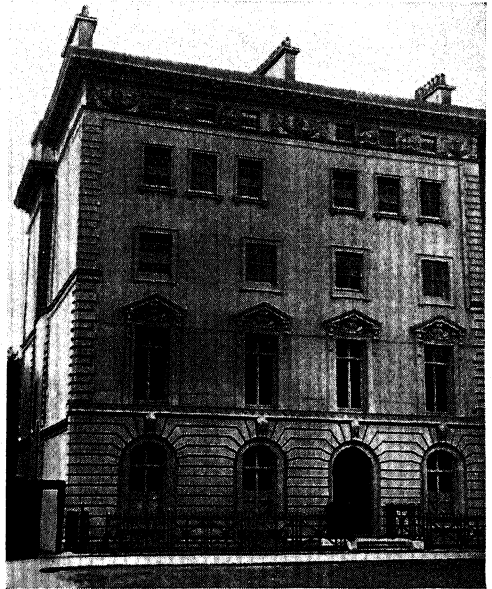


Photo: U & U

AMERICAN EMBASSY, LONDON

The building was presented to the government of the United States by J. Pierpont Morgan.

Baltic Sea and the North Sea, and in a few places in Great Britain and the United States. The pale-yellow or yellowish-brown substance, with its characteristic luster, is much used in making cigar-holders, mouthpieces for pipes, and beads, and the ash obtained by burning it forms the basis of the finest black varnish.

In the beginning, amber was in soft form, and often specimens are found in which are imbedded the remains of insects; and the fact that these insects are always of species which no longer exist proves that it was ages ago that the amber was secreted.

In prehistoric times the amber trade was carried on from Sweden to Egypt and the islands of the Mediterranean Sea. The ancient Greeks obtained amber from the shores of the Baltic Sea, just where it is most plentiful today, and they called it *elektron*. One of their philosophers, interested in the properties of matter, discovered that if this substance were rubbed briskly it became capable of attracting to itself light objects, such as straws and bits of paper. This strange quality, which gave to man his first knowledge of electricity, was never lost sight of, and centuries afterward, when the study of this property in certain objects became a real science and a name was needed for it, the name *electricity*, taken from the Greek *elektron*, was chosen. The English form of *elektron* is *electron*. See ELECTRICITY. T.B.J.

AMBERGRIS, *am' bur greez*, a fatty, waxlike secretion, found in the intestines of the sperm whale and used in perfumes, because it has the property of making enduring the odors of the perfumes. Ambergris is never found in healthy whales; it is supposed to be a secretion of intestines that have become diseased through the sperm whale's custom of eating squid and cuttlefish. Sometimes it is excreted by the whales and floats on the water, or is cast on the seashore in lumps. Large quantities



are also taken from the intestines of dead whales. When inside the whale, it has a disagreeable odor, but on exposure to air it acquires a sweet, earthy fragrance. With the increasing scarcity of the sperm whale, ambergris is becoming very high-priced. See WHALE (Whale Products).

AMBITION. Most words have fascinating life

stories, and *ambition* is no exception, for its derivation is rich in historical interest. Long ago, in the days of ancient Rome, those who were candidates for public office went about from house to house soliciting votes. This practice received the name of *ambitio*, meaning *going about canvassing*, from *ambio*, signifying *I go around*.

"Vaulting Ambition." From such an origin, the word has come to be used to characterize that selfish, overmastering desire for power, fame, or wealth that stops at nothing until the goal is reached. In this sense it is rightly considered "one of the meanest of passions," as someone has stigmatized it. It was this type of ambition that Shakespeare had in mind when he wrote of "virtue choked with foul ambition," and "vaulting ambition, which o'erleaps itself."

Historical and Literary Examples.

The student of history finds striking examples of inordinate ambition in such figures as Caesar, Napoleon, Richelieu, Wolsey, and Talleyrand, and in more modern days, King Ferdinand of Bulgaria, in whose ambition to make Bulgaria the Prussia of the Balkan states lay the source of the two Balkan wars. In literature the outstanding type of unscrupulous and futile ambition is the character of Macbeth, as delineated by the master-hand of Shakespeare. Uriah Heep in *David Copperfield* is a familiar example of overweening ambition, although on a petty scale.

In the land of fable we have the tale of the frog who, ambitious to be as big as the ox, puffed himself to the point of bursting. Mythology, too, is full of stories illustrating the folly of ambition carried to an extreme; for instance, the myth of Phaethon, who was ambitious to drive the chariot of the sun. Learn

and his father, who made themselves wings of wax, thinking to soar to the abode of the gods; King Midas, dreaming of possessing unlimited gold and coming to grief through the sudden realization of his selfish dream.

[The reader is referred in these volumes, in their alphabetical places, to articles on the men and the mythological characters mentioned above.]

Praiseworthy Ambition. As the Roman rhetorician Quintilian sagely remarked, "Though ambition in itself is a vice, yet it is often the parent of virtues." To attain great wealth or personal glory, a man must usually renounce ease, comfort, and self-indulgence; he must develop habits of persistence, industry, economy, study, and unresting activity, depending upon the goal at which he is aiming. In this way, perhaps, it has come about that the word is now applied also in a favorable sense, meaning the eager aspiration toward higher things, the steadfast determination and unflagging effort which lead to the achievement of some worthy purpose. It is a creditable ambition to seek to improve character, to develop ability, to reach out after a broader education, to give a higher quality of service to the world. Great public benefactors like Clara Barton, Jane Addams, and Luther Burbank; captains of industry like Marshall Field, merchant, and James J. Hill, builder of railroads; inventors like Stephenson, Edison, and Marconi; daring explorers like Byrd, Scott, Amundsen, and Peary—all these were fired with the high ambition to do some real work in the world. Ambition is a virtue or a vice, then, according to its object and the means employed in attaining that object.

Ambition and Emulation. Emulation consists in trying to equal or surpass the record of some other person. It is emulation that inspires a boy or girl in school to strive for marks and prizes rather than true knowledge, and to rest content with distancing the others in his class, regardless of what the victory means to him personally. Ambition is "made of sterner stuff." Ambition keeps the boy or girl, man or woman, constantly pushing forward toward a clearly visioned goal, ever trying to *get ahead of himself*. Ambition looks to the surpassing of *yesterday's* record, not a neighbor's achievement. It was true ambition that enabled the great artist, Joshua Reynolds, to reply, when asked how he had developed his remarkable ability, "By observing one simple rule; namely, to make each picture the best." This suggests the famous motto of the Paulist Fathers, "Let the highest achievement of yesterday be the starting point of to-day." Such a desire to excel one's own best work is the best kind of ambition.

Cultivating Ambition. The spirit of ambition is natural to every child born into the world. Every boy and girl is entitled to

Outline on Ambition

Motto:

"Too low they build who build beneath the stars."—Young's *Night Thoughts*.

Essay on Ambition:

- (a) To develop our talents
- (b) To make use of our opportunities
- (c) To make some progress every day
- (d) To serve worthily
- (e) To make our ideal *real*

Biography:

Helen Keller	Alexander Hamilton
James G. Blaine	Wm. D. Howells
Henry Clay	Abraham Lincoln
Stephen A. Douglas	Charles A. Lindbergh

Poems:

Longing—Lowell
Days—Emerson
The Gleam—Tennyson
Friend Brook—Lucy Larcom
The Chambered Nautilus—Holmes
The Song of the Chattahoochee—Lanier

Supplementary Reading:

Gradatim—J. G. Holland
The Vision of Sir Launfal—Lowell
The Story of Dick Whittington
 Myths of *Phaethon* and *Ariadne*
 Essay, *Of Ambition*—Bacon

Quotations:

Hitch your wagon to a star.—Emerson
 If I shoot at the sun I may hit a star.
 —P.T. Barnum.
 Be thou contented with thy lot in earthly things,
 But be forever seeking after angels' wings
 —J.T.W.
 An aspiration is a joy forever, a possession as solid as a landed estate.—R. L. Stevenson.
 There is nothing noble in being superior to some other man. The true nobility is in being superior to your previous self.
 —Hindoo Saying.
 Aspire, break bonds, I say.
 Endeavor to be good, and better still,
 And best. Success is nought, endeavor's all.
 —Browning.

home encouragement and help in bringing his ambitions to the point of fruition. He needs and should have home aids in the way of good books and magazines; he needs the interested coöperation of father and mother; he needs the loving, helpful hand stretched out to assist him in solving his individual problems.

Failing to receive such sympathy and assistance in realizing his ambitions, on meeting obstacles he finds himself utterly unable to cope with them unaided, and discouragement follows.

The result is not only the failure of the particular object the child was cherishing; eventually it may mean also the death of all ambition, initiative, and effort; till at length, through failing to progress, he has dropped so far behind in achievement that he can prob-

ably never regain that fine spirit of eager aspiration and confident trying which is his birth-right. Ambition must be cultivated and fostered during the early years of childhood, especially, if it is to develop into the hardy, governing motive that will shape a successful life. The world belongs to the energetic and the ambitious.

The Physical Side. It is also to be noted that educators struggling with the problem of the seemingly ambitionless pupil are now looking for the explanation, not only in a careless, unsympathetic home environment, but in physical causes, as well. Experiment and tests have shown that a large proportion of such cases spring from diseases of the ductless glands and from defective sight, hearing, or breathing. When these defects receive expert medical attention, the child quickly regains the ambition and energy characteristic of normal boys and girls. Given the right home conditions, he is then prepared to apply himself to the solution of his special problems of home, school, and society, and to compete with his fellows with an equal chance of success.

AMBLYOPIA. See **BLINDNESS** (Common Eye Diseases); **EYE**, same subheading.

AMBRIDGE, PA. See **PENNSYLVANIA** (back of map).

AMBRINE, *am' breeen*. See **FIRST AID TO THE INJURED**.

AMBROSIA, *am bro' zhi ah*, with nectar, in Greek and Roman myths, was considered the food and drink of the gods, and a substance that gave them their immortal youth. Not only did they eat and drink of ambrosia, but they bathed in it and used it as an ointment. A god who went without ambrosia for a time suffered a loss of power, while a mortal who fed on it gained godlike strength and immortality. The adjective *ambrosial*, meaning *sweet-smelling*, or *delicious*, is derived from the word. It is so used in a familiar line from Tennyson's *In Memoriam*, "Sweet after showers, ambrosial air." Another use of the term is from Milton's *Paradise Lost*, Book IV, Line 218:

And all amid them stood the Tree of Life,
High eminent, blooming ambrosial fruit
Of vegetable gold.

Of course, it is proper to assume that ambrosia, as a real substance, never existed; it is as much a myth as the gods whose food it is declared to have been.

AMEN, *a men'*, a word used most commonly at the end of a prayer or hymn as a sort of summing up, a repeated wish that everything asked for may be granted, everything stated may be true. The "verily, verily" frequently used in the New Testament at the beginning of a statement is a translation of the word *amen*. Pronounced quite frequently *ay men* in ordinary speech, it is invariably *ah men* in

singing and usually in poetry, as in the *Lost Chord*, where occurs the line, "Like the sound of a great Amen."

Derivation. The word is from the Hebrew; it means *it is trustworthy*, or *be it so*, and was taken over into the Greek without change of form and then into Latin and the modern languages.

AMENDMENT, a term applied in legislative procedure to the alteration or modification of an existing law by the addition of a new enactment relating to it. When an amendment has been adopted, it takes the place of the deleted section and becomes a part of the original. In parliamentary bodies amendments may be made to bills, resolutions, or motions under consideration. The rule followed everywhere is that an amendment to a resolution or bill may be amended, but that an amendment to the amendment cannot be further amended.

In the Congress of the United States, one house may amend a bill which has passed the other house, but such bill, with the amendment, must be returned to the first body for approval. If further amended, it must be returned to the other house; if no agreement is reached, the bill is sent to a joint committee.

The United States Constitution provides for its own amendment in these words (Art. V):

The Congress, whenever two-thirds of both houses shall deem it necessary, shall propose amendments to this Constitution; or, on the application of the legislatures of two-thirds of the several states, shall call a convention for proposing amendments, which, in either case, shall be valid to all intents and purposes, as part of this Constitution, when ratified by the legislatures of three-fourths of the several states, or by conventions in three-fourths thereof, as the one or the other mode of ratification may be proposed by the Congress; provided . . . that no state, without its consent, shall be deprived of its equal suffrage in the Senate.

[For the amendments which have been added to the United States Constitution, see **CONSTITUTION OF THE UNITED STATES**.]

AMENHOTEP IV, *am en ho' tep*. See **TUT-ANKHAMEN**.

AMENT, *am' ent*, another name for catkin (which see).

AMERICA, a great land mass which exceeds in its north-to-south extent any other land area on the globe, and which separates throughout its entire length the Atlantic and Pacific oceans. Stretching through 128° of latitude, from 72° N. to 56° S., it is 9,000 miles in length, and is washed at one extremity by the Arctic, at the other by the Antarctic, Ocean. Its greatest breadth, from the easternmost point of Brazil to the westernmost point of Peru, is over 3,000 miles, while its narrowest part, on the Isthmus of Panama, is little more than twenty-eight miles. The two great divisions, North America and South America, which make up the continent, are more or less similar

in shape; each is roughly triangular, with its greatest breadth toward the north.

Despite the fact that Columbus was the first European to take to Europe definite knowledge of the New World, Americus Vesputius received the honor of having his name given to it. Because Vesputius had explored and described the coast of Brazil, a map-maker in 1507 suggested that that part of the newly discovered hemisphere be called by his name, and the new title was gradually extended to cover all of South America. Still later, when the close connection between the two grand divisions was discovered, the one name was made to do duty for both, but the custom properly fell into disuse.

Strangely, it became customary in Canada years ago to refer to the United States as America. This designation is now less employed.

Related Subjects. The reader is referred in these volumes to the following articles

Columbus, Christopher	South America
North America	Vesputius, Americus

AMERICA, the national hymn of the United States, beginning with the words, "My country, 'tis of thee." The words were written by the Reverend Samuel Smith (which see), and were first used in 1832 at a children's Fourth of July celebration in Boston. Years afterward, at a reunion of the Harvard class of which both Smith and Oliver Wendell Holmes were members, Holmes read a poem entitled *The Boys*, in which he spoke of Smith in the words:

Here's a nice youngster of excellent pith;
Fate tried to conceal him by naming him Smith,
But he chanted a song for the brave and the free;
Just read on his medal, "My country, of thee."

The music to *America* was borrowed from England. The melody in its present form is attributed to Henry Carey, author of *God Save the King* (which see), which he set to this music. The words of this best-known of America's national hymns are as follows:

My country, 'tis of thee,
Sweet land of liberty,
Of thee I sing;
Land where my fathers died,
Land of the pilgrims' pride,
From every mountain side
Let freedom ring.

My native country, thee—
Land of the noble free—
Thy name I love;
I love thy rocks and rills,
Thy woods and templed hills;
My heart with rapture thrills
Like that above.

Let music swell the breeze,
And ring from all the trees
Sweet freedom's song;

Let mortal tongues awake;
Let all that breathe partake;
Let rocks their silence break—
The sound prolong.

Our fathers' God, to thee,
Author of liberty,
To thee we sing:
Long may our land be bright
With freedom's holy light;
Protect us by thy might,
Great God, our King.

AMERICAN ACADEMY OF ARTS AND LETTERS, an organization of distinguished artists, musicians, and authors, established in 1904. The members of the Academy, whose number is limited to fifty, are chosen from the National Institute of Arts and Letters, an organization of 250 members. The larger body was founded in 1898 by a committee of the American Social Science Association, with the purpose of creating in the United States an association like the Institute of France.

After the Institute had established itself, and included most of the prominent writers and artists of the United States, a new and smaller organization was planned, to be called the American Academy of Arts and Letters. Its constitution states that the purpose of the Academy is to further and represent the interests of fine arts and literature.

AMERICAN ACADEMY OF ARTS AND SCIENCES. See **ACADEMY** (American Academies).

AMERICAN ACADEMY OF NATURAL SCIENCES. See **ACADEMY** (American Academies).

AMERICAN ASSOCIATION OF UNIVERSITY WOMEN, founded in Boston, in 1882, as the Association of Collegiate Alumnae. Its first members were drawn from the alumnae of Vassar, Smith, Oberlin, Wellesley, Boston University, Cornell, the University of Wisconsin, and the University of Michigan. The purpose of the organization was to carry on "practical educational work," which took the form of seeking to improve the conditions of higher education for women. Investigations and recommendations were made to the colleges on the academic status of women and the desirable physical environment for them. Throughout the life of the Association, standards have constantly been raised by the use of an accredited list of institutions whose alumnae are eligible to membership. To-day about 160 colleges and universities are on this list.

The Association of Collegiate Alumnae became a national organization through its federation, first with the Western Association of Collegiate Alumnae in 1880, and then with the Southern Association of College Women in 1921. In 1919 and 1920, when the International Federation of University Women was

organized, the American Association became one of the first members.

The National Headquarters of the Association is located in Washington, D. C., in the building which also houses the national clubhouse of the organization. There are about 430 branches, scattered throughout the United States. For administrative purposes, the country is divided into nine sections, the affairs of each being handled by a sectional director. In addition, the branches in thirty-seven states are federated in state divisions.

The activities of the American Association of University Women relate chiefly to education. A fellowship fund has been built up by using one-eighth of the national income in dues. At present the Committee on Fellowships, under the chairmanship of Professor Agnes Rogers of Bryn Mawr College, awards annually ten to twelve fellowships to women engaged in graduate work or in advanced, independent research. A number of these fellowships are used for study or research in foreign countries. The Association is now engaged in a campaign to increase its fellowship funds, as well as to make its contribution to the Fellowship Endowment of the International Federation of University Women. The work of rating institutions of higher learning which apply for recognition by the Association is carried on by a special standing committee.

The Association sponsors a study program for its members which includes the fields of education and international relations. Approximately three hundred branches conduct study groups on the pre-school child, on elementary education, or on adolescent problems. About half that number have international-relations round tables, which concern themselves with some phase of contemporary world politics. To guide the study groups, outlines and bibliographies are made available by the offices of the educational and international-relations secretaries, at national headquarters. The Association has been aided in carrying out its study program by grants from the Laura Spelman Rockefeller Memorial (see EDUCATIONAL FOUNDATIONS) and the Carnegie Corporation. The Association cooperates with other organizations in endorsing legislation concerned with education.

The publications of the American Association of University Women include a quarterly *Journal* and a monthly bulletin of information on Association activities for the use of branch officers. The *Journal* contains articles pertaining to general educational questions and to matters of interest to college women. B.R.

AMERICAN BEAUTY ROSE, a choice, cultivated variety, famous for the size of its blossom and its rare coloring. The velvety petals of the showy, fragrant flowers are of a

carmine-crimson shade, tinged with soft violet, and the blossoms are borne on long, thick, woody stems. The peculiar hue of this rose is copied in dyes having the name "American Beauty Red." It is the favorite flower for social functions where expense is not considered, the choicer specimens bringing high prices. Authorities on rose culture say that the amateur cannot hope to raise the American Beauty with success, because this aristocrat among flowers demands skill and training, a certain temperature, and a properly constructed hothouse for its cultivation.

The flower was first produced in a rose nursery in Baltimore, Md., and was introduced to the trade by a florist of Washington, D. C. See ROSE. B.M.D.

AMERICAN BIBLE SOCIETY. See BIBLE SOCIETY, AMERICAN.

AMERICAN BILL OF RIGHTS, a term applied to the first ten Amendments to the Federal Constitution. See BILL OF RIGHTS; CONSTITUTION OF THE UNITED STATES.

AMERICAN COLLEGE FOR WOMEN. See CONSTANTINOPLE.

AMERICAN ENGINEERING STANDARDS COMMITTEE. See STANDARDIZATION IN INDUSTRY.

AMERICAN FABUS. See FABIVS.

AMERICAN FALLS DAM. See IDAHO (Irrigation).

AMERICAN FEDERATION OF LABOR, a national federation of trade unions. For details of its history and organization, see LABOR ORGANIZATIONS.

AMERICAN GOLDFINCH, YELLOW-BIRD, or THISTLE-BIRD, sometimes called the *wild canary*, is one of the most attractive of North American song birds. It is found generally over the United States and in parts of Southern Canada, moving southward in winter, but some remain in the Northern states all winter. The bird is about four and three-fourths inches in length. In summer the male is a bright yellow, with black cap, wings, and tail; the female is olive-brown above, yellowish below, with wings and tail a dull blackish-brown. In the winter time the male dons a more sober coat, and then greatly resembles the female. The nest, a graceful little cup made of grass and vegetable fiber and lined with grass and plant down, is usually placed in a bush, in a thistle, or in the crotch of a low tree. The eggs, which are pale-bluish or bluish-white, number three to six. Goldfinches nest late in the season, in July, August, and September. A nest with young just ready to fly has been found as late as September 28.

The goldfinch is a sociable bird, and on the approach of spring, the males, dressed in their handsome new coats, may be seen in little groups, sitting on the branches of a tree, bask-

ing in the sun and warbling soft, pretty music which has an elusive suggestion of sadness. The goldfinch is very fond of the seeds of the thistle, sunflower, and other weedy plants, and also eats small insects, thus proving its economic value.

The *European goldfinch*, which resembles its American cousin in habits, is cinnamon-brown on the back, and has a black crown, black wings marked with yellow, a black tail, and white under parts. About the base of the bill is an area of bright red. It ranges throughout Europe, except in the regions farthest north. It has been introduced into the United States, and a few are now found in New Jersey, New York, and New England. Its eggs, four or five in number, are bluish-white, marked with purple. This attractive bird is a favorite cage songster in European homes. See CANARY. D.L.

Scientific Names. Goldfinches belong to the family of finches and sparrows, *Fringillidae*. The American goldfinch is *Astragalinus tristis*. The European goldfinch is *Carduelis carduelis*.

AMERICANIZATION, a *mer i kan i za'-shun*, the process of gradual assimilation of alien peoples, reshaping their customs and ideals to meet the American requirements of good citizenship, and developing in their consciousness a just appreciation of the land of their adoption.

Immigrants who have reached middle age are likely to resist influences which would change the established current of their thought, though there are many exceptions to the rule. In a new land, surrounded by conditions they



THE MAKING OF A CITIZEN

The transformation of an immigrant is shown in the two pictures. The first is from a photograph of a woman and her baby on their arrival in America; the second was taken a few years later. The homemade dress, the scarf for the head, and the coarse shoes have been replaced by modish clothing. The youthful appearance of the woman suggests that she might be the daughter of the immigrant. The contrast emphasizes the miracle that is possible in the Americanization of the alien.

little understand, they retain their native group associations, for common protection, as they assume, and their social isolation is more or less complete. Those from Southern and Eastern Europe, particularly, colonize in the great cities, and thus in a congested center we may have a "little Italy," a Ghetto, a "little Russia," and the like, to which the residents bring the habits and customs of the land of their birth, and to which they resolutely adhere. While indeed in America, they are not a part of the real America.

The youthful mind is more plastic, and while the ingrained influences of generations are strong, they cannot long resist the inevitable effects of contact with young America and the programs planned in campaigns to remove class and race consciousness. The spirit of emulation and imitation is strong in young people; it is seen that boys and girls, born in other lands, very soon acquire the dress of the land of their adoption. This is evidence

of fertile ground in which to plant ideas of Americanism.

Americanization efforts are directed to change the alien mind as completely as the change in costume. The public schools are the greatest factor in Americanization; free evening schools and factory classes, churches, civic clubs and organizations, playgrounds, social settlements, community centers, and the printing press are effective means. But Americans themselves, by the example of loyalty, patriotism, and knowledge of our institutions, are a large factor in the problem. E.D.F.

Related Subjects. The reader is referred in these volumes to the following articles:

Alien	Illiteracy
Citizen	Immigration
Community Interests	Naturalization
Ghetto	Social Settlement
Hull House	Sociology

AMERICAN LEGION, a patriotic organization devoted to the common interests and aims of those who served in the World War, for the purpose of perpetuating the friendships formed during the war and with the determination that the disabled shall receive proper care and consideration as the years fade out the picture of sacrifice they endured.

Notwithstanding that the thought of such an organization occurred to many men, it remained for a group of twenty typical soldiers of the A.E.F. (American Expeditionary Forces) to deal with the idea in a concrete way and to lay the foundation for the organization that became the Legion.



LEGION EMBLEM

A meeting had been called by General Headquarters of the A.E.F. of these twenty national guard and reserve officers of field rank, in order to obtain from them an expression as to the wants, inclinations, and needs of the non-professional soldiers who constituted such a vast majority of the American army. These officers were asked to submit recommendations designed to improve the morale of the troops. The A.E.F. was homesick and restless.

Lieut. Col. Theodore Roosevelt was one of the twenty reserve officers. He conceived that the time was ripe to make a tentative and initial stand for crystallizing the widespread feeling in the American army that some sort of an organization of veterans, dedicated in peace to the same high ideals that had animated them in war, must grow out of their comradeship in arms. Roosevelt gave a dinner to the twenty delegates in February, 1919, and they there informally discussed the steps that must be taken to launch this dream of a veterans' organization. These twenty officers constituted themselves a temporary committee to take the necessary steps for gathering together from the whole A.E.F. a body of several hundred officers and men who would be of a character to command the confidence and support of all units in all the states. It was assumed that this contemplated caucus would name delegates to attend a joint caucus of delegates from all parts of the country.

The twenty officers used heroic means to spread the story of the contemplated veterans' organization through all ranks and sections of the A.E.F., with the result that a caucus was convened with 1,000 representative officers and enlisted men of the A.E.F. in attendance. The caucus was held in the Cirque de Paris, in the French capital, in March, 1919.

First Steps. Eben Putnam, national historian of the Legion, wrote about the organization of the Legion in part as follows:

This caucus, which will live in memory as "the

Paris Caucus," was called to order by Eric Fisher Wood, in the absence of Roosevelt, who had acted as chairman of the temporary committee, but who had returned to the United States on a mission to promote interest in the new organization among the troops at home. Nearly 1,000 delegates, ranging in rank from private to brigadier general, were present; and the spirit of democracy that has since become characteristic of Legion meetings was established by a resolution, offered by Lemuel Bolles, eliminating all consideration of rank or precedence in the deliberations of the caucus.

Bennett C. Clark was elected temporary chairman. The caucus outlined tentative aims and purposes, and adopted a temporary constitution and the name, "The American Legion." Definite commitment to permanent policies was postponed until on the return of the A.E.F. a great caucus could be held at some point in the United States which would be truly representative of every branch of the service and of every state.

An executive Committee of 100 was elected to complete the organization in the A.E.F. and arrange for the meeting in the United States. Milton J. Foreman was elected chairman of this committee, and George A. White was chosen secretary. Every soldier of the A.E.F. was automatically made a member of the organization pending definite arrangements to be made later. A subcommittee of seventeen, headed by Bennett C. Clark, was sent to the United States to effect an organization among the troops at home.

Coincident with the organization in France, a movement originated in Washington, D. C., where, in February, 1919, an informal gathering of men who had served in the war was held at the Cosmos Club, presided over by E. Lester Jones, to consider the advisability of forming a national veterans' organization. It was decided to hold a caucus in March and to get in touch with whatever movement might be successful in France. At the caucus, also held at the Cosmos Club, an organization was effected. Three hundred seventy enlisted men and officers attended this meeting, and formed an organization known as General Pershing Post No. 1, World War Veterans, but it was determined to proceed no further until in touch with the overseas movement.

Immediately upon the arrival of Eric Fisher Wood in the United States, he communicated with Colonel Jones, and the Washington unit at once accepted the plans formulated at the Paris Caucus, with the result that the Washington unit ultimately became George Washington Post No. 1, Department of District of Columbia, The American Legion. Other local organizations composed of ex-service men in various parts of the country also joined in the movement.

The temporary working committees formed in every state arranged for the election of delegates to a national caucus and effected working organizations to handle the varied problems presented by the demobilization of veterans.

The Saint Louis caucus was held May 8, 9, and 10, 1919, and was called to order by Theodore Roosevelt, Jr. Roosevelt declined a unanimous election as chairman, and Henry D. Lindsley of Texas was then elected. The expected period of economic and industrial unrest was at hand, and radical agitation had reached proportions unprecedented in America. The eyes of the country were upon the caucus of the infant American Legion, and relief was evident when the caucus placed the Legion unmistakably on record

as a great patriotic organization opposed to radicalism in any form.

The caucus adopted a tentative constitution more fully outlining the Legion's aims and purposes, and created machinery to effect a permanent organization. Another executive committee was elected, which immediately delegated its powers to a sub-committee of seventeen which, consolidated with the A.E.F. Executive Committee, was known as the "Joint Committee of Thirty-four."

Temporary national headquarters were opened in New York City, where a working committee of five met daily to deal with the varied problems of the new and rapidly growing organization. This working committee was composed of Henry D. Lindsley of Texas, chairman; Bennett C. Clark of Missouri, vice-chairman; Eric Fisher Wood of Pennsylvania, secretary; Dr. Richard Derby of New York; and Franklin D'Olier of Pennsylvania. Thomas W. Miller of Delaware and Luke Lea of Tennessee served as joint chairmen of the Legislative Committee; J. F. J. Herbert of Massachusetts as chairman of the speakers' bureau; G. P. Putnam, of New York, chairman of publication committee, and George A. White, of Oregon, editor of *The American Legion Weekly*. Relief work, employment, and Americanization were the principal activities of the Legion at that time.

A national charter was granted by Congress, September 16, 1919, and the charter convention was held in Minneapolis, November 10, 11, and 12. The Minneapolis convention approved the acts of the temporary organization and adopted a permanent constitution. Franklin D'Olier was elected the first national commander, and Lemuel Bolles became the first national adjutant. Permanent headquarters were established in Indianapolis, Ind.

The Legion was engaged in 1919 and 1920 in the almost superhuman task of creating something tangible out of an organization that actually existed only on paper. Part of the A.E.F. was still in France or Germany; part was in the United States, and a part had been demobilized. This condition held true of the navy and of the millions of men who served in the training camps. All of these men and women were preoccupied to the exclusion of nearly everything else with the task of readjusting themselves to civil life.

It was during these two years that the groundwork was laid with an eye to permanency. Aims and purposes had to be fixed and defined so that men and women exalted by the unselfishness of war-time service could cleave to them as goals worthily chosen.

First Work of the Legion. In 1921 the nation plunged into the depths of industrial stagnation. Millions of men were thrown abruptly out of work, some with others dependent upon them. The depression came just when 4,000,000 men had been thrust back into civil life. Great uneasiness existed, because some said that those 4,000,000 veterans were tainted with bolshevism. The American Legion, almost overnight, turned itself into a nation-wide employment bureau, with 11,000 branches. Veterans reported at posts for jobs, and found them.

More than 1,000,000 men obtained work through the Legion's efforts, and the talk of bolshevism among veterans died.

As part of its fight for the relief of wounded and disabled soldiers, the Legion organized a rehabilitation service, in order that fights for claims of the disabled could be carried on successfully, and to see that every claimant for government compensation received justice. This service continues, and will continue until there is no longer need for it. The disabled veteran is a charge of the Legion that is placed above everything else. A great step had been taken, and America began to realize that the Legion was a power for good that could not be disregarded.

In the years 1923 and 1924, there came to a head the great issue for some form of adjusted compensation that had been started in demobilization days. It was a bitterly fought struggle that reached the heights of a national controversy. The Legion never retreated from its position that aid for those financially disabled by the war was just.

The Endowment Fund. With this victory won, it was only fitting that in 1925 the Legion should take cognizance of another class of war sufferers, the most pitiful of all. These were the children of the men who had either been killed in action or who had died as a result of their war service. The Legion carried to a successful conclusion a campaign to raise a \$5,000,000 endowment fund, the income from which will be used for the aid and care of orphans and disabled veterans. That fund is now invested in safe securities. It will provide an income as long as the Legion exists, and then will be used for as nearly similar a purpose as possible when its present need is past.

Thus, briefly, the Legion's history approached another great milestone. Its every effort had been rewarded with full success; its power had been established; its desire for service was unquestioned. But in relieving the unemployed, bringing justice to the disabled, and providing for the orphans, it had worked for others to the detriment of itself as an organization.

Drives for New Members. Each year had found the Legion's ranks growing thinner. It had neglected its internal welfare, with the result that membership decreased and needed constant attention. It was recognized that its power to do good could be measured only by its strength in membership, and as the public was vitally interested in all of the Legion's endeavors, the building up of its membership became a public affair. Campaigns to increase its membership resulted in 1926 in adding 80,000 more members to the rolls; the work continued, with corresponding increases in members. Business men, great corporations, governors, mayors, and public-spirited citizens

entered into the Legion's effort to enroll all possible ex-service men in Legion work.

Important as this membership effort continued to be, with employers in many parts of the country encouraging it to the extent that they offered to pay the dues if their eligible employees would join, another greater goal came into view.

Community Service. To many of those who have watched Legion history there has been noticeable a distinct trend in policy, a definite working toward a certain objective. The movement has not always been apparent to the public, nor, for that matter, to many Legionnaires themselves, because it was necessary in the first years of the organization to meet and carry out emergency public issues. But all this time the Legion was preparing itself to do one thing. And that thing, that great objective worthy of the Legion, something that will be a life work of the organization, is community service. For the first time, it was decreed by an annual national convention that community service should be the main objective of the organization. This was in the year 1927, a year of many endeavors, including the conclusion of the Legion's great pilgrimage to France.

The Legion has been preparing itself to turn its proven strength to upbuilding the community in which it lives. It is a noble ambition, a magnificent ideal, a field in which the Legion will labor throughout its existence. In community service the Legion has found an issue as great as the Legion itself. To visualize the vast possibilities of this objective, one need only to consider the results that have already been achieved by more than 10,000 posts doing some worth-while things for their particular communities. One needs only to think of the effect on the United States as a whole of the sum total of those efforts—efforts that will affect Portland, Oregon, and Portland, Maine; New York and California; Florida and Minnesota, and the other states. From one end of

the country to the other, the gigantic efforts are being registered.

At the present time the Legion is composed of three-quarters of a million ex-service men and women, knit together by the most trying years of any organization's existence and by the common interest in the country's welfare. More and more the Legion is living up to the preamble of its constitution:

For God and country: To uphold and defend the Constitution of the United States; to maintain law

and order; to foster and perpetuate a 100 per cent Americanism; to preserve the memories and incidents of our association in the Great War; to inculcate a sense of individual obligation to the community, state, and nation; to combat the autocracy of both the classes and the masses; to make right the master of might; to promote peace and good will on earth; to safeguard and transmit to posterity the principles of justice, freedom, and democracy; to consecrate and sanctify our comradeship by our devotion to mutual helpfulness.
F.G.C.



"THE DOUGHBOY OF THE WEST"

In a competition, this statue was selected for reproductions to be placed in the capitol grounds of ten Western states.

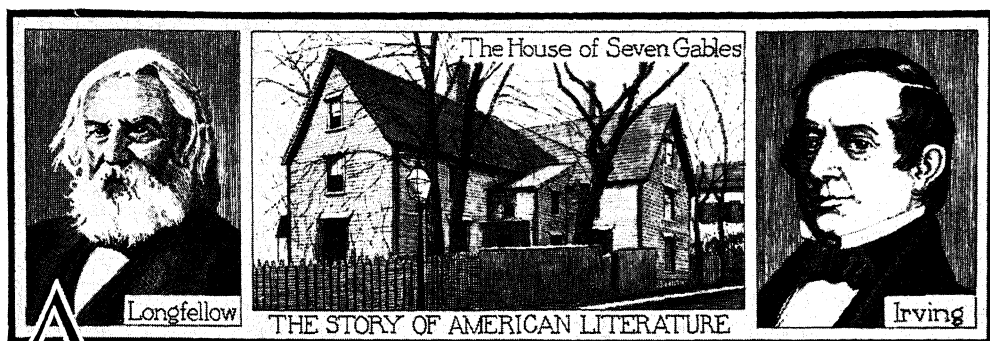
ments, and gifts, the Association maintains executive headquarters at 520 North Michigan Avenue, Chicago, Ill., with a salaried secretary, a staff of over fifty professional experts and assistants, and hundreds of members enlisted in the work, the latter serving without remuneration.

In 1926 the Association celebrated its fiftieth anniversary at a conference in Atlantic City; twenty-eight foreign countries were represented.

[The publications of the Association form a valuable part of its service and include *The Booklist* and the *A.L.A. Bulletin* (monthly); the *A.L.A. Catalog*, an annotated list of over 10,000 books; *A Library Survey*; *Manuals of Library Economy*; and the *Reading with a Purpose* series.]

AMERICAN LIBRARY ASSOCIATION, an organization founded in 1876 for the purpose of developing the service of the library to the public, fostering the education of both child and adult through its use, and for cooperating with foreign libraries regarding international library problems.

Supported by membership dues, endow-



A AMERICAN LITERATURE. In a sense, American literature is a part of English literature, since it makes use of the same language, but it has grown up under such different conditions, among such different surroundings, that it possesses a distinct identity. Many of Irving's essays, Hawthorne's *House of the Seven Gables*, Cooper's *Leather Stocking Tales*, and Longfellow's *Evangeline*, are distinctly American, not merely because their scenes are laid in America, but because they breathe the spirit of the new land.

Its Beginnings. The United States has a history which dates back 300 years, and since many of the men who made its earliest history were scholars, it produced literature of a kind through the early period. But literature in the broader sense—those writings which all the reading world accepts and authorities class with really worthy productions—it has had for little more than a century.

They were serious folk, those early producers of literature in America, and the conditions in the new home were not such as to encourage artistic production. Histories of the colonies; dissertations on liberty, the desire for which had led many of them across the sea; profound theological treatises; solemn song books—these were the earliest output of the colonies. Occasionally one figure stood out far above the rest. There was Anne Bradstreet, for instance, the title-page of whose publications heralded her as "The Tenth Muse, lately sprung up in America"; her works, however, show nothing of the life of the new land to which she had come as a bride, but drone on about solemn "world facts."

The National Era

The "Pioneers." Only with the nineteenth century did the United States begin to produce literature that attracted favorable attention abroad. Men had made permanent homes for themselves, had won the liberty without which they felt that life could not broaden to its full, and at length they had time for joy and for beauty. The first man to respond to the new, scarce-conscious demand and to

Two of the greatest names in this very early history of literature in New England were those of Increase and Cotton Mather, autocratic father and ascetic son, whose works were highly regarded in their day, but have won no recognition from posterity. Jonathan Edwards had a more far-reaching influence, and his *Freedom of the Will* is still recognized as a masterpiece of reasoning.

The Stirring Revolutionary Times. These early figures in the literature of America seem very far away and indistinct, but with the thrilling events which led to the Revolution, and with the Revolution itself, there came into prominence a man who stands even to these later days as a typical American—Benjamin Franklin. His writings, and particularly his *Autobiography*, which ranks with the great biographies of all time, mark the beginning of a new era in American literature.

As the colonial period was interested most of all in religion, the Revolutionary era concerned itself chiefly with politics, and most of the great statesmen of the day left some mark on the literature of the period. *The Federalist*, the Declaration of Independence, and Franklin's *Autobiography* stand as monuments of this era, when men were too much engaged in doing to find much time for writing.

No time is without its verse-writers, and this Revolutionary period had several, of whom only one, Philip Freneau, possessed enough force and originality to write verse that would live. The earliest novel-writer of note, Charles Brockden Brown, lived in this period, and his weird romances fairly bristle with horrors.

win international recognition was Washington Irving, whose genial spirit no less than his delightful style makes him to this day one of the best loved of American authors. In poetry, the great name of those early days was that of Bryant, whose *Thanatopsis* stands as "an event and a landmark" in American literature. It is impossible to imagine a present-day boy of seventeen producing such

a poem, yet that was Bryant's age when he wrote:

So live that when thy summons comes to join
The innumerable caravan, which moves
To that mysterious realm, where each shall take
His chamber in the silent halls of death,
Thou go not, like the quarry-slave at night,
Scourged to his dungeon, but, sustained and soothed
By an unfaltering trust, approach thy grave
Like one who wraps the drapery of his couch
About him, and lies down to pleasant dreams.

Another outstanding figure in the early half of the century was James Fenimore Cooper, whose *Spy*, published in 1821, was the first typically American novel. He almost always has "a forest trail to follow or a windy sea to sail," and his stories will live for the action with which they abound. With this pioneer group, too, must be reckoned Edgar Allan Poe, accounted by many critics the supreme genius in the history of American literature. It is difficult to say which is more masterly, his prose or his poetry. Certainly little in the entire range of literature in English can surpass in pure music some of his verse.

The skies they were ashen and sober;
The leaves they were crisp'd and sere,
The leaves they were wickering and sere;
It was night in the lonesome October
Of my most immemorial year;
It was hard by the dim lake of Auber,
In the misty mid-region of Weir:
It was down by the dank tarn of Auber,
In the ghoul-haunted woodland of Weir.

A lesser writer, but one much admired in his own day and still read with pleasure, was Nathaniel P. Willis, who wrote both prose and poetry.

Later Prose Writers. As writers become more numerous, it is simpler to consider separately the two great branches, prose-writers and poets, though some have attained distinction in both lines. Two men who stand in the very front rank among men of letters, if the opinion of the majority of critics be taken, were born early in the nineteenth century—Emerson in 1803, and Hawthorne a year later. The philosophy of the one, with its inspiring, prophetic note, and the romances of the other, with their perfect artistry, made it apparent that the formative period of American literature was over. Prescott, Motley, and Parkman proved that the United States could not only make history, but write it, and they left a worthy tradition of historic writing which later writers, such as Fiske, Roosevelt, and Wilson, have worthily supported.

Contemporary with Emerson and Hawthorne, but claimed by a later period because they lived longer, were Oliver Wendell Holmes and James Russell Lowell. Both wrote poetry, and Lowell, especially, is known for that rather than for his prose works, but his essays marked

an epoch in the history of criticism in America. Holmes's *Autocrat of the Breakfast Table*, with its delightfully intimate but scholarly style, ranks as one of the classics of literature. A charming example of Holmes's clever way of treating his material is the following:

When we are as yet small children, long before the time when those two grown ladies offer us the choice of Hercules, there comes to us a youthful angel, holding in his right hand cubes like dice, and in his left spheres like marbles. The cubes are of stainless ivory, and on each is written in letters of gold—TRUTH. The spheres are veined and streaked and spotted beneath, with a dark crimson flush above where the light falls on them, and in a certain aspect you can make out upon every one of them the three letters, L, I, E.

The child to whom they are offered very probably clutches at both. The spheres are the most convenient things in the world; they roll with the least possible impulse just where the child would have them. The cubes will not roll at all; they have a great talent for standing still, and always keep right side up. But very soon the young philosopher finds that things which roll so easily are very apt to roll into the wrong corner, and to get out of his way when he most wants them, while he always knows where to find the others, which stay where they are left.

Of later prose writers, many have attained distinction, especially in the field of fiction. Harriet Beecher Stowe, Howells, Mary E. Wilkins Freeman, Henry James, Silas Weir Mitchell, Bret Harte, Edward Eggleston—each name stands for something distinctive in American literature. It is impossible to think of Mrs. Stowe, for instance, without connecting her with her epoch-making *Uncle Tom's Cabin*; of Mary E. Wilkins Freeman without calling up pictures, wonderfully clear but none too cheerful, of New England life; of Edward Eggleston without associating him with picturesque pioneer days in Indiana. A novelist, too, was Samuel Clemens (Mark Twain), but his humor was so distinctive and distinguishing a characteristic that his genuine story-telling power has not always been appreciated by all Americans.

More recently, there has been an ever-expanding list. The drama may flourish or languish, poetry go unheard, essays gather dust, but the stream of fiction flows on. To name but a few of the outstanding figures, there have been Joel Chandler Harris, Frank Norris, James Lane Allen, Edith Wharton, George W. Cable, Irvin Shrewsbury Cobb, Margaret Deland, Booth Tarkington, Gertrude Atherton, Winston Churchill, Robert Herrick, Willa Cather, Joseph Hergesheimer, Sinclair Lewis, and Zona Gale. At the close of the article *Novel*, the reader will find a list of the fiction writers whose biographies are included in these volumes.

Poets. Those New England contemporaries, Holmes, Emerson, and Lowell, who pro-


CHARACTERS *from* AMERICAN LITERATURE




Hester
Prynne




Evangeline



Rip Van Winkle



George F.
Babbitt



Huckleberry Finn



Hiawatha

duced some of the finest of American prose, formed with Longfellow and Whittier the most distinguished group of poets the United States has yet seen. Critics may declare that some of these were popular poets rather than great poets, but criticism cannot loosen the firm hold which they have on the affections of their readers. Longfellow's *Hiawatha* stands to thousands as the supreme epic of America, and the schoolboy never ceases to thrill at hearing how—

Forth upon the Gitche Gumees,
Of the shining Big-Sea-Water,
With his fishing-line of cedar,
Of the twisted bark of cedar,
Forth to catch the sturgeon Nahma,
Mishe-Nahma, King of Fishes,
In his birch-canoe exulting,
All alone went Hiawatha;

while every returning winter makes new and fresh the charm of Whittier's *Snowbound*:

Unwarmed by any sunset light
The gray day darkened into night,
A night made hoary with the swarm
And whirl-dance of the blinding storm,
As zigzag, wavering to and fro,
Crossed and recrossed the wingéd snow:
And ere the early bedtime came
The white drift piled the window-frame,
And through the glass the clothes-line post
Looked in like tall and sheeted ghosts.

Whitman and Lanier, two other poets, one representing New York and one the South, it is interesting to contrast. Lanier said of Whitman that he was "poetry's butcher," who gives us "huge, raw collops slashed from the rump of poetry"; and it is not difficult to understand the aversion which the writer of exquisite music felt for the other's rough-hewn measures. Contrast Whitman's—

Creeds and schools in abeyance,
Retiring back awhile sufficed at what they are, but
never forgotten,
I harbor for good or bad, I permit to speak at every
hazard,
Nature without check with original energy.
with Lanier's—

Out of the hills of Habersham,
Down the valleys of Hall,
I hurry amain to reach the plain,
Run the rapid and leap the fall,
Split at the rock and together again,
Accept my bed, or narrow or wide,
And flee from folly on every side
With a lover's pain to attain the plain
Far from the hills of Habersham,
Far from the valleys of Hall.

Poe and Lanier are the most conspicuous poetic geniuses the South has produced, but a number of others have done very creditable work. Noteworthy among these are Paul Hamilton Hayne, William Gilmore Simms, and Henry Timrod, all of whom have places in

any anthology which attempts to include what is most representative in American poetry.

Following these were Eugene Field and James Whitcomb Riley, poets who have made a special appeal to the popular heart. Differing in many ways, they were alike in this, that they knew how to find the poetry, the tenderness, in everyday things and how to treat of them so simply that the man who cares little or nothing for other poetry finds heartfelt pleasure in theirs. Field is especially the poet of children—his lullabies have a swaying motion; his "real boy" poems a swing and "go" that make them favorites everywhere. Sometimes the touch of pathos is strong, as in *Little Boy Blue*:

The little toy dog is covered with dust,
But sturdy and stanch he stands;
And the little toy soldier is red with rust,
And his musket moulds in his hands.
Time was when the little toy dog was new,
And the soldier was passing fair;
And that was the time when our Little Boy Blue
Kissed them and put them there.

But more often he sings of happy children, like the very real little boy who declares that—

I'd like to be a cowboy, and ride a fiery horse
'Way out into the big an' boundin' west;
I'd kill the bears an' catymounts and wolves I came
across,
An' I'd pluck the bald-head eagle from his nest.
With my pistol by my side I'd roam the prairies wide,
An' to scalp the savage Injine in his wigwam would
I ride—
If I durst—but I *durstn't*!

Riley treats with kindly sentiment all phases of the Indiana life he knew so well, using frequently the Hoosier "dialect," as in—

Little Orphant Annie's come to our house to stay,
An' wash the cups an' saucers up, and brush the
crumbs away,
An' shoo the chickens off the porch, an' dust the
hearth, an' sweep,
An' make the fire, an' bake the bread, an' earn her
board-an'-keep;
An' all us other children, when the supper things is
done,
We set around the kitchen fire an' has the mostest fun
A-list'nin' to the witch-ales 'at Annie tells about,
An' the Gobble-uns 'at gits you
Ef you
Don't
Watch
Out!

Among other older poets may be mentioned Joaquin Miller; Edwin Markham, famed for "The Man with the Hoe", one of the most popular American poems; Edward R. Sill; Thomas B. Aldrich, who was gifted alike in poetry, prose, and the drama; Richard W. Gilder, great editor of the *Century Magazine*, and a poet of rare gifts; and William Vaughn Moody, middle-West poet and dramatist.

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 Edmund Clarence Stedman. 1833-1908
Pan in Wall Street
 Paul Lawrence Dunbar. 1872-1906
Candle-Lightin' Time
 John Godfrey Saxe. 1816-1887
Fables and Legends
 Frank L. Stanton. 1857-1927
Songs of the Soil
 Edgar Lee Masters. 1868-
Spoon River Anthology
 William Gilmore Simms. 1806-1870
Marion, "The Swamp Fox"
 Paul Hamilton Hayne. 1830-1886
In the Wheat-Field
 Samuel Minturn Peck. 1854-
The Grapevine Swing
 Madison Cawein. 1865-1915
Kentucky Poems
 Robert Loveman. 1864-
It isn't raining rain to me
 Amy Lowell. 1874-1925
What's O'Clock
 Carl Sandburg. 1878-
Smoke and Steel
 Vachel Lindsay. 1879-
General Booth Enters Heaven
 Edgar A. Guest. 1881-
When Day Is Done
 Sara Teasdale. 1884-
Love Songs
 Louis Untermeyer. 1885-
This Singing World
 Joyce Kilmer. 1886-1918
Trees
 Alan Seeger. 1888-1916
I Have a Rendezvous with Death
 Edna St. Vincent Millay. 1892-
The Harp Weaver
 Conrad Aiken. 1889-
The House of Dust

Miscellaneous Writers

Thomas Paine. 1737-1809
Age of Reason
 Jared Sparks. 1789-1866
Life of Benjamin Franklin
 Donald G. Mitchell. 1822-1908
Reveries of a Bachelor
 Edward Everett Hale. 1823-1909
The Man without a Country
 George William Curtis. 1824-1892
Prue and I
 Bayard Taylor. 1825-1878
The Lands of the Saracen
 Charles Francis Adams. 1835-1915
Railroads, Their Origin and Problems

The More Recent Poets. Not many years ago it was possible at almost any time to pick up a literary magazine and find discussion as to whether or not poetry is in decline, but during the World War period and the decade following it was very apparent that America was experiencing a renaissance of poetry. While the recent years have produced no poets of the caliber of Shelley or Wordsworth, there have been many whose true inspiration cannot be denied, many who have "followed the gleam" with singleness of purpose and have written poems that will live. Within half a dozen years after the close of the World War, far more people were reading and writing poetry in America than for a long time past. Among the elements contributing to this awakened interest may be mentioned the magazine called *Poetry*, edited by Harriet Monroe and published in Chicago. In giving encouragement to new forms of verse and to new writers, this periodical has been a creative force.

A very interesting development of the newer poetry has been the vogue of so-called "free verse." The old stanza, meter, and rhyme, declare many of the present-day writers, hamper genius and make real poetic freedom impossible; and they adopt, therefore, a new form, or absence of form. Not only does free verse refuse to be bound by restraints of meter, but it insists that all subjects are alike poetic, and that the true artist may see as much beauty in a display of red shoes in a window as in a riot of red roses in a garden. Their idea is not entirely new—Whitman was the strong advocate of just such a theory; but the new poets are not exactly followers of Whitman. One of the strongest of these free-verse writers is undoubtedly Edgar Lee Masters, whose *Spoon River Anthology* was one of the most discussed books of its year. The following lines from this collection of epitaphs show free verse at its best:

I winged my bird,
Though he flew toward the setting sun;
But just as the shot rang out, he soared
Up and up through the splinters of golden light,
Till he turned right over, feathers ruffled,
With some of the down of him floating near,
And fell like a plummet into the grass.
I tramped about, parting the tangles,
Till I saw a splash of blood on a stump,
And the quail lying close to the rotten roots.
I reached my hand, but saw no brier,
But something pricked and stung and numbed it.
And then, in a second, I spied the rattler—
The shutters wide in his yellow eyes,
The head of him arched, sunk back in the rings of him,
A circle of filth, the color of ashes,
Or oak leaves bleached under layers of leaves.
I stood like a stone as he shrank and uncoiled
And started to crawl beneath the stump,
When I fell limp in the grass.

In the hands of uninspired writers, free verse is hardly readable, and the movement has probably passed its zenith of influence. Nevertheless, it has produced some poetry of a very high order, and has been a vitalizing force in modern literature.

Also to be included in the group of worthwhile modern poets are Percy Mackaye, known widely as a writer of poetic drama; Vachel Lindsay, whose poems have the power and imagination of the old minstrel lays; Amy Lowell (died 1925), versatile and original; Louis Untermeyer, gifted with the power to see romantic beauty in everyday life; Sara Teasdale, whose poems have high lyric beauty and are perfect in form; Carl Sandburg, a Chicago poet whose verse is singularly akin to Walt Whitman's in form; Edna St. Vincent Millay, writer of finely inspired verse; and Conrad Aiken, the author of several poems distinguished by melody and colorful word pictures. Edgar Guest, who belongs to the school of Field and Riley, has a wide following among those who enjoy poetry of everyday life. The World War took from America two young poets of great promise—Allan Seeger and Joyce Kilmer. The former is remembered chiefly for the beautiful *I Have a Rendezvous with Death*; the latter wrote many lovely lyrics, but perhaps the best known is the one beginning—

I think that I shall never see
A poem lovely as a tree.

Related Subjects. The foregoing discussion has of necessity been of a general sort, for it is intended to serve merely as a basis for more extended study. Most of the authors mentioned here are given full discussion in these volumes under their respective names, while the articles on ESSAY, NOVEL, POETRY, DRAMA, and HISTORY contain information and index lists which should be used in connection with this study. See, also, LITERATURE (Literature for Children).

AMERICAN MARMOT. See GROUND HOG.

AMERICAN PARTY, a political organization in the United States, founded in 1854, which was later merged with the Know-Nothing party (which see). The latter name was given because of the endeavor of its members always to preserve secrecy as to their movements. They were instructed to reply, "I do not know," to any question regarding their party.

The American party was at first a secret political organization, the chief object of which was to prevent foreigners from emigrating to America, and to promote the exclusive choice of Americans for political office. In 1856 the party nominated Ex-President Fillmore for the Presidency, and he received eight electoral votes; in 1860 no nomination was made, but the party united with the Constitutional Union party (which see); it received thirty-nine electoral votes. The American party reappeared in 1880 with a national ticket,

but was given only 707 votes; in 1888 there were 1,590 votes cast for the party's candidate in California, but in no other state in the Union. The party then disbanded. See POLITICAL PARTIES.

AMERICAN PLAN, in hotels. See HOTEL.

AMERICAN PLANE TREE. See SYCAMORE.

AMERICAN RUGBY. See FOOTBALL (In the United States).

AMERICAN SABLE. See SABLE, for classification.

AMERICAN SAMOA. See SAMOA.

AMERICAN SCHOOL OF CLASSICAL STUDIES. See ATHENS (The Modern City).

AMERICAN TITIAN. See ALLSTON, WASHINGTON.

AMERICAN UNIVERSITY, a school devoted to graduate work, under control of the Methodist Episcopal Church, located in Washington, D. C. It was incorporated in 1891, but was not opened until 1914. A student seeking admission must possess a bachelor's degree or give evidence of equivalent learning. A system of fellowships is provided (see FELLOWSHIP).

AMERICAN WOMAN'S SUFFRAGE ASSOCIATION. See SHAW, ANNA HOWARD.

AMERICUS, GA. See GEORGIA (back of map).

AMERICUS VESPUTIUS, *a mer' i kus ves pu' shus*, an explorer for whom America was named. See VESPUTIUS, AMERICUS.

AMERIGO VESPUCCI. See VESPUTIUS.

AMES, OAKES. See CREDIT MOBILIER.

AMESBURY, MASS. See MASSACHUSETTS (back of map).

AMETHYST, *am' e thist*, a semi-precious stone of a beautiful violet or purple color, given its name (which means *without wine*) by the Greeks because they believed that it protected one against the evil effects of strong drink. It is a variety of quartz, which usually occurs in crystals, and the coloring is supposed to be due to manganese. Amethysts occur in Siberia, India, Ceylon, Madagascar, Persia, Uruguay, Brazil, and Mexico; and in the United States large quantities of excellent quality are found around Thunder Bay on Lake Superior. Because it makes the skin look white, the amethyst is a popular stone for rings and for necklaces, the dark-purple varieties being favored. This stone is the birthstone for February (see BIRTHSTONES).

The so-called *oriental amethyst* is a variety of corundum (which see). T.B.J.

AMFORTAS, *am faw' tahs*. See PARSIFAL.

AMHERST, *am' urst*, JEFFREY, Baron (1717-1797), an English soldier who was largely instrumental in winning Canada for Great Britain. He entered the army in 1731 and served in various European campaigns until

Pitt promoted him from lieutenant colonel to major general in 1753, and gave him the command of the expedition against Louisbourg, which surrendered after a short siege. In September, 1758, he became commander in chief of the British forces in America, and in the next year led his army to victory at Crown Point and Ticonderoga.

For his services in wresting Canada from the French for Great Britain, he was made Governor-General and was formally thanked by Parliament. After his return to England in 1763, he held a number of important offices, including that of absentee governor of Virginia from 1763 to 1768. From 1772 to 1795, with the exception of a single year, he was commander in chief of the British army. He was raised to the peerage in 1776, and was made field marshal in 1796.

AMHERST COLLEGE, at Amherst, Mass., one of the most renowned of the smaller colleges, exclusively for men. Though its faculty numbers only about sixty-five and its student body averages 700 to 750, its high standards are conspicuous, and from its foundation it has consistently aimed to be a small college of the best type. Fraternities play an important part in the student life.

The college is fortunate in its location. The town of Amherst (population, about 5,200), twenty-three miles north of Springfield, lies in the beautiful Connecticut Valley, within sight of Mount Holyoke. Here the earnest Presbyterians and Congregationalists of Western Massachusetts founded an academy in 1815, six years later changing it to a college. Here also is the State Agricultural College, opened in 1867, and not far away are Smith College and Mount Holyoke College.

AMIENS, *ah mya N'*. See FRANCE (Interesting Cities).

AMINO, *am' i no*, **ACIDS**. See PROTEINS; FOOD (Proteins); METABOLISM.

AMIR, *a meer'*, the former title of the ruler of Afghanistan (which see).

AMISH, *ah' mish*, **CHURCH**, a branch of the Mennonite Church in America. See MENNONITES.

AMMAN, *ahm ahm'*, capital of Transjordan (which see).

AMMETER, *am' me tur*. See AMPERE, subhead.

AMMON, *am' on*, the national god of the ancient Egyptians, identified by the Greeks with their supreme god Zeus. In later times he was called Ammon-Re, meaning *Ammon the Sun*. At first his seat of worship was Thebes, the No-Ammon (City of Ammon) of the Old Testament. After his worship became national, a celebrated temple was erected to him in the Libyan Desert. In statues Ammon is generally represented in human form, wearing a headdress from which two immense feathers

rise. The ram was sacred to him. The goddess Mut was his wife.



AMMON AND MUT

The greatest present-day value of this example of old Egyptian art is in the idea it conveys of ancient dress and peculiar square-lined figures, doubtless a survival of older rock carving.

AMMONIA, a *mo' ni ah*, a colorless gas which dissolves so readily in water that it is almost always used in its liquid form, known as *aqueous ammonia* or *spirits of hartshorn*. The latter is an old name originating in the ancient method of producing ammonia by heating the horns of harts, or stags, in closed vessels. Many decaying animal substances give off ammonia gas, and at such places as stockyards much of the refuse matter, as bones, hoofs, and horns, was formerly used in making ammonia. In Scotland it is obtained as a by-product in making petroleum from oil shale. By far the larger quantity, however, is obtained as a by-product in the making of gas from coal. Ammonia has qualities which readily distinguish it from other gases. First, there is its sharp, stinging odor; a strong inhalation will bring tears to the eyes. Then, too, it is an alkali (which see), and as such has a decided value in restoring color to fabrics which have acids spilled on them. For this purpose it has the great advantage over other alkalis in that if more is put on than necessary to neutralize the acid, the excess of ammonia will quickly pass into the air.

Uses. Combined with various acids, ammonia forms salts which are of value for many purposes, while in its free form it is used in the manufacture of artificial ice (see below) and of soda. Aqueous ammonia is used in the house-

hold. Ammonia contains the elements nitrogen and hydrogen. The former makes it a valuable plant food, and it is therefore employed as a fertilizer, generally as sulphate of ammonia. *Ammonium nitrate*, or nitrate of ammonia, is extensively used in the manufacture of explosives. *Ammonium chloride*, or sal ammoniac, is used in calico dyeing and in cleaning metals before soldering or galvanizing. It is also used in some types of electric batteries. When reduced to a temperature of -34° C., ammonia becomes a liquid instead of a gas, and in turning back to a gas again it absorbs from the air or any other substances about it a great deal of heat. For this reason, it is of the greatest importance in the business of cold storage and in the making of ice. See ICE; COLD STORAGE.

Synthesis. As already noted, ammonia is a compound of nitrogen with hydrogen. Nitrogen is the most abundant constituent of the air. It is not very difficult to separate atmospheric nitrogen from oxygen, the other chief constituent. Hydrogen also can be made without much expense. It has been found possible to combine the elements nitrogen and hydrogen to form ammonia. This is done by mixing the two gases, one volume of nitrogen to three of hydrogen, putting on a very high pressure, and heating almost to redness in the presence of a suitable catalyst (see CATALYSIS). This process is called the synthesis of ammonia—synthesis meaning *putting together*. T.B.J.

Chemical Formula. The formula of ammonia is NH_3 . That is, each molecule consists of one atom of nitrogen and three atoms of hydrogen.

AMMONIUM CHLORIDE, *am mo' ni um klo' ride*. See SAL AMMONIAC.

AMMUNITION, *am yu nish' un*, a comprehensive term used to describe all that is necessary for firing guns of all sizes. Armies in the field are supplied with what is called *fixed ammunition* for use with machine guns, small cannon, rifles, carbines, revolvers, and pistols. This ammunition consists of a cartridge made of drawn brass with a charge of some explosive and a bullet or shell. Being in one piece, it is easily handled, and rapid fire can be maintained. Field artillery firing shells of more than 4-inch caliber is supplied with ammunition in which the explosive propellant and the shell are loaded separately. A modern howitzer fires a shell weighing as much as 2,800 pounds, and special mechanical contrivances are necessary to hoist the shell into the breech of the gun. The powder is loaded separately, in cloth bags, which are placed in a brass cartridge, after the shell has been forced into place. Such big guns can fire not more than two shots per minute. Lighter artillery, firing shells weighing twelve or eighteen pounds, may discharge six or eight shells per minute.

AMMUNITION



WAR



SPORT



Various types of shells



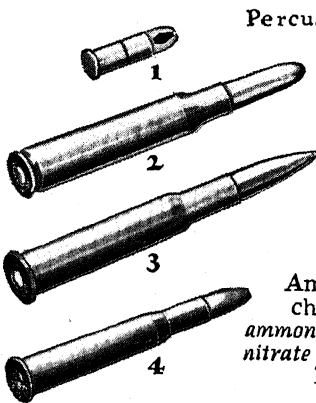
Largest shell



Old style cannon and round shot



BB cap
Smallest cartridge



- 1 .22 automatic.hollow point
- 2 7 m/m, machine guns
- 3 .30 army pointed
- 4 .25-35 superspeed: muzzle vel. 2,700 ft. sec., muzzle energy 1410 ft. lbs.

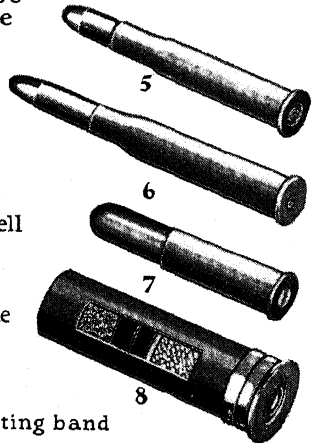
Percussion fuse



Steel body of shell

Smoke bag

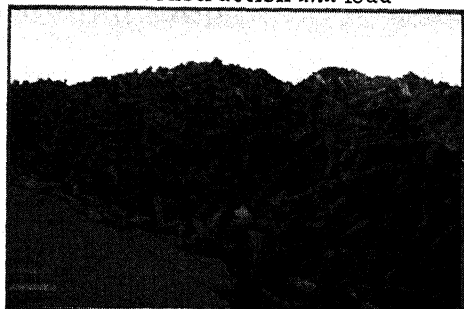
Rotating band



- 5 .30 soft point, big game
- 6 .303 British, soft pt. or full patch bullet
- 7 .44 shot cartridge
- 8 shotgun shell, showing construction and load



Shells stacked



Heap of 75mm shell cases after firing

Explosives. There are a great number of explosives used in ammunition, and though all are based on the same principles, no two armies use exactly the same formula. Explosives used to propel the shell (propellants) are of the class usually called smokeless powders. They consist chiefly of nitroglycerine or nitrocellulose. They are commonly manufactured in the form of sticks, though granular forms are sometimes used. Cordite, ballistite, and lyddite are among the most powerful used.

Explosives used to explode the shell when it has reached its objective are picric acid, T.N.T. (tri-nitro-toluene), and amatol. Many other materials were tried during the World War, but these were the most effective.

So keen is the desire among nations to possess the most deadly destroyer that constant improvements are being made and fresh discoveries announced. All shells of more than one pound in weight fired from big guns are explosive. Each shell contains a charge of powder which causes the shell to burst, by means of a time fuse, at a certain distance from the gun, or on striking any object in its flight. In the World War a very high percentage of wounds was inflicted by "shrapnel" shell, the most destructive form of projectile yet invented. It consists of a metal base, containing a charge of powder and from 350 to 700 bullets, according to its size. The shell is burst by the charge and the bullets are released, plunging forward and spreading with terrific force.

Special shells developed during the World War were made by filling ordinary shells with gas-forming materials, liquid prisms, smoke-producing substances, incendiary materials to produce effects along the lines indicated. There were also illuminating, or star, shells which contained parachutes supporting a flare, by which large areas could be illuminated at night.

Modern Bullets. The modern rifle bullet is made of a core of lead, covered with a coat of nickel or steel. It is oval in shape and has rather a sharp point. Each soldier in the field carries 100 cartridges, his store being replenished from ammunition carts which follow the troops into action. The effective range of modern rifles is about 3,000 yards, or nearly two miles, while big guns will send a shell weighing considerably more than a ton a distance of from seventeen to twenty miles.

In the World War Germany possessed one style of great gun which bombarded Paris from a distance of 76 miles. The shells weighed 265 pounds. The great range was obtained by firing at such an elevation that the projectile passed up into the rarefied atmosphere, where it met small resistance. The shell at its highest point reached a height of twenty-four miles. The best military opinion now considers the airplane more efficient than this

type of gun, because the former can carry a heavier charge and can drop it with much greater accuracy.

Cartridges of the highest type for shot guns are made of brass or paper and brass and loaded with a smokeless powder and a charge of pellets or shot varying in size according to the game to be hunted. Cartridges for sporting rifles are similar to those used by the military, but the bullet is usually heavier, in order to kill big game.

Several new designs of rifle and machine-gun ammunition were developed during the World War. Increased range was obtained for both these types of arms by changing the contour of the bullet. It was made pointed instead of round-nosed, as had previously been done. *Tracer bullets* were designed to assist in air-plane fighting. They were made with a burning composition attached for the purpose of leaving a visible trail of flame or smoke. *Armor-piercing bullets* were also designed for use against aircraft, tanks, and armored cars. These were bullets jacketed with steel to give the maximum penetrating power.

Naval Ammunition. Ammunition used in naval warfare differs from that used on land in that the purpose in view is the destruction of ships rather than men. The shells fired are therefore designed to pierce the armor of the vessel and sink or disable it. Naval guns of 12- and 15-inch caliber are used by big vessels, firing shells with hardened-steel points. The effective range for such shells is as great as eight to ten miles. The World War (1914-18) brought into greater prominence than ever before in the history of the world the destructive value of the torpedo, a cigar-shaped cylinder containing a charge of powerful explosive which is discharged by percussion on coming in contact with a vessel.

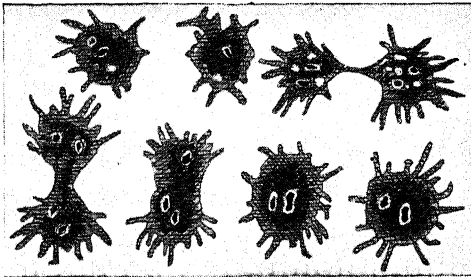
There have been many international conferences concerning ammunition that may or may not be used in warfare. A certain amount of humanity may be exercised even in war, and it is generally considered that it is not necessary to mutilate men in order to put them out of a fight. Hence the use of expansive bullets, called *dum-dum* bullets, which flatten on impact and inflict a terrible wound, has been universally condemned. Supplying modern armies with ammunition is one of the greatest problems of war, for the expenditure of shells is enormous. The German armies before Lemberg sent more than a quarter of a million shells into the Russian positions in twenty-four hours.

Related Subjects. The guns which demand the ammunition described above, from the rapid-firing machine guns to the terribly destructive howitzers, are described under the title ARTILLERY. See, also, EXPLOSIVES; SMOKELESS POWDER; TORPEDO.

AMNESIA, *am ne' shi ah*. See APHASIA.

AMNESTY, *am' nes tie*, a term taken from the Greek word for *forgetfulness*, used in English with much the same meaning, though in a very special sense which implies both forgiving and forgetting. When a number of people have taken part in wrong-doing against a government, and the government feels that they have been punished sufficiently or should be spared punishment altogether, it proclaims amnesty, which makes the wrong-doing as if it had never been. Sometimes there are conditions attached which must be observed, but more often the pardon is free. Thus, in 1863 President Lincoln issued a proclamation of amnesty, offering forgiveness to those who had been engaged in the War of Secession if they would swear to support the United States government; but in 1868 President Johnson issued another proclamation, which absolved all without requiring an oath. Amnesty must not be confused with pardon (which see).

AMOEBA, *a me' bah*, the simplest form of animal life, a one-celled creature belonging to the lowest division of the animal kingdom,



AMOEBAE

the Protozoa (which see). Because of its simple organization, it is an excellent subject for the study of cell structure and some of the processes that go on in a living cell, for the same kind of cell structure is found also in higher animals. See **CELL**.

The common amoeba is about one-hundredth part of an inch in diameter, and most species can be seen only by the aid of a microscope. Amoebae inhabit shallow waters; some species are found in fresh water, and some in salt; they appear as shapeless, naked masses of protoplasm (which see), containing granules and droplets of oil and of water. Within the cell lies a small denser mass, of differentiated protoplasm, the nucleus.

When observed under the microscope, the protoplasm of an amoeba is seen to be in a constant streaming movement. In addition to these internal movements, the amoeba may move from place to place. To do so, it sends out in various parts of the body little finger-like projections called *pseudopodia* (which means *false feet*). It then pushes forward these pro-

jections in some parts of the body, the main mass of the amoeba seeming to flow into them, and meanwhile retracts those in the opposite parts. Cells which have the peculiarity of moving in the same way are called *amoeboid*. The white corpuscles in the blood of human beings have the power of amoeboid movement.

When an amoeba has reached a certain size, it divides into two. This division starts first in the nucleus and then in the other mass of protoplasm, until it forms two amoebae. See **ZOOLOGY** (How Zoölogy Affects Human Welfare). S.H.S.

Scientific Name. The scientific name of the amoeba is *Amoeba proteus*.

AMORICA. See **BRITTANY**.

AM'ORITES, a heathen nation in early Palestine. See **CANAANITES**.

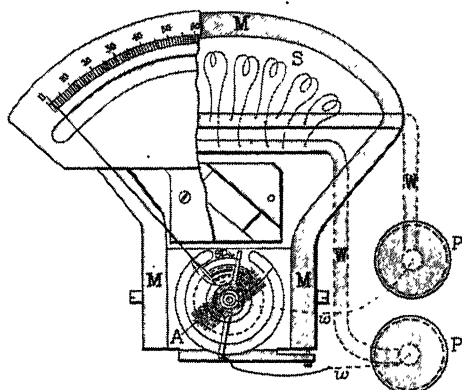
AMORTIZATION, *a mauw ti za' shun*, in finance, the process of charging off, extinguishing, or redeeming the funded debt or the capital investment of a manufacturing plant or mine (getting back the capital which was invested) during the life of the enterprise. It is usually accomplished by means of a sinking fund. F.H.E.

AMOY, *a moi'*, one of the five Chinese ports thrown open to foreign commerce by a treaty between England and China in 1842. It is situated on the island of the same name, to the west of Formosa, at the mouth of the Kelung River. It has an excellent harbor and was formerly the center of the tea trade of China. The tea that was sunk in Boston harbor in 1773 came from Amoy. Considerable commerce is carried on, the principal imports being opium, cotton, indigo, and grain; the chief exports, tea, camphor, sugar, paper, and earthenware. The business section is well built, with good docks, warehouses, and office buildings, but the native quarter is squalid and unhealthful. Flourishing mission stations have long been maintained in Amoy, where the animosity against the "foreign devils," as all white people are called, is not so strong as in the interior of the country.

In the seventeenth century the Portuguese traded considerably with Amoy, but they were driven out on account of cruelty and debauchery. The British captured the town in 1841 and compelled the Chinese to grant trading facilities. Population (postal report), 300,000, of whom only about 500 are Europeans.

AMPERE, *am pehr'*, the unit of intensity of an electric current. Because electricity seems to flow through substances, an electric current is often compared to a fluid, such as water, flowing through a pipe. Such a comparison is very serviceable in explaining electrical phenomena, even though we know that electricity is not a fluid. The rate of flow for a current of water is designated as so many gallons or

cubic feet per second. In the case of an electric current (which is neither visible nor tangible), the intensity is ascertained from the effects of the current. Whenever a current of electricity is passed through a solution which contains a metal, the electricity deposits the metal as a solid. The process is *electrolysis*, and the



A PORTABLE AMMETER

The diagram shows the essential parts of a portable ammeter with moving coil. PP are the binding posts, by means of which connections are made to the instrument. The large wires WW run from the binding posts to the shunt S, and small wires ww extend to the armature coil A. This coil is mounted on pivots, and is free to move between the pole pieces of the permanent magnet MMM. When electrical energy flows through the coil, it tends to turn so that its magnetism may be parallel to the lines of force of MMM. The motion is opposed by the springs sp, so that it is proportional to the current.

unit of intensity of the current is the *ampere*. This unit is defined (by international agreement) as the steady current which deposits silver at the rate of 0.001118 of a gram per second from a solution of silver nitrate in water, the solution having a specified concentration. Arc lamps used in street-lighting require from five to ten amperes; a four-pound flatiron, from three to five; the starting motor of an automobile, from 150 to 200. The unit of resistance to the flow of current is the *ohm*; the unit of electromotive force driving the current is the *volt*. Amperes equal volts divided by ohms (see OHM).

The Ammeter. The instrument used in measuring the number of amperes flowing in a circuit is an ampere-meter, commonly called *ammeter*. It is a portable form of galvanometer, and consists essentially of a coil of fine wire wound about a soft-iron cylinder, or core, and pivoted on jeweled bearings in such a way as to move freely between the poles of a permanent magnet. A metal strip, or shunt, passes between the terminals of the instrument, so that only a small fraction of the current to be measured flows through the coil. This device prevents the burning out of the coil. Two spiral springs lead the current

into and away from the coil. When a current flows through it, the coil turns so that the magnetism of the core may be parallel to the lines of force of the permanent magnet, but the motion is resisted by the springs, and thus is proportional to the current. A pointer attached to the coil moves across a graduated scale, indicating the number of amperes flowing through the circuit. Ammeters are constructed to measure currents varying from a few thousandths of an ampere to several thousand.

André Marie Ampère (1775-1836), for whom the ampere was named, was a French physicist and mathematician. Ampère proved the identity of magnetism and electricity, and investigated the subject of electric currents. He first stated two simple laws which form the basis of modern electrical practice: (1) Two parallel currents having the same direction attract each other; (2) two parallel currents having opposite directions repel each other. He also invented a form of needle which made possible the galvanometer. H.S.E.

Related Subjects. The reader is referred in these volumes to the following articles:

Electrolysis	Kilowatt	Ohm
Galvanometer		Volt

AMPHIBIANS, *am fib' e anz*, a class of creeping or leaping cold-blooded animals (*Amphibia*) that hatch from eggs and breathe at first by means of gills, and afterward partly or wholly by means of lungs. They are sometimes called *batrachians*. Amphibia, the preferred name, is from a Greek word meaning *having a double life*, and is given to these animals because they can live both on the land and in water. In all stages of growth, however, they must have moisture.

Amphibians are divided into two groups: the tailless, containing toads and frogs, and the tailed, containing newts and salamanders. The eggs are laid in fresh-water streams and ponds, and the young are called *tadpoles*. Amphibians are backboned animals, and so belong to the group *Vertebrata* (see VERTEBRATES). In the scheme of classification they occupy a place between fishes and reptiles. M.J.H.

Related Topics. For a description of the more important amphibians, as well as for illustrative material, consult the following articles:

Batrachia	Salamander
Bullfrog	Tadpole
Frog	Toad
Mud Puppy	Tree Frog
Newt	Zoölogy

AMPHION, *am fi' on*, in mythology. See NIOBE.

AMPHIOXUS, *am fi ahk' sus*. See ZOÖLOGY (Divisions of the Animal World).

AMPLIFIER. See RADIO COMMUNICATION.

AMPUTATION, the cutting away of a projecting part. The amputation of a leg in surgery means cutting off a leg or a part thereof. The various names given amputations refer to the parts amputated, or the method employed, or the name of some surgeon.

Before the days of anesthetics and antiseptics, the death rate after amputations was

high. Because of the great pain of the operation, shock was great. The rapidity with which the operation was done was partly responsible for the tendency to hemorrhage. However, most of the bad results were due to infection of the wound.

The present method of amputating is as follows:

The patient is anesthetized, and the parts are cleaned thoroughly. Some form of tourniquet (which see) is used to stop the flow of blood through the large vessels. All is then ready for the operation. The soft parts are cut through in such a way as to leave flaps of the size and shape required best to cover the stump. The bones are sawed off. The large blood vessels are tied. The tourniquet is loosened, all the bleeding points are caught with forceps, and such as require it are tied. The flaps of muscle are sewed over the stump. The wound in the skin is brought together by fine sutures. The wound is cleaned, and dressings are applied. In making an amputation, infection, hemorrhage, and shock must be guarded against. These are the immediate requirements. After complete recovery, the stump should be usable with both comfort and efficiency. See ANESTHETIC; ANTISEPTIC.

W.A.E.

AMSTERDAM, *am' stur dam*, Holland's metropolis and one of the chief commercial cities of Europe, famous for its art treasures and as the center of the diamond-cutting industry of the world. The name means the *dam of the Amstel*, the river which flows through the city. On account of the lowness of its site, the city is drained by numerous canals crossed by nearly 300 bridges; the canals divide the city into



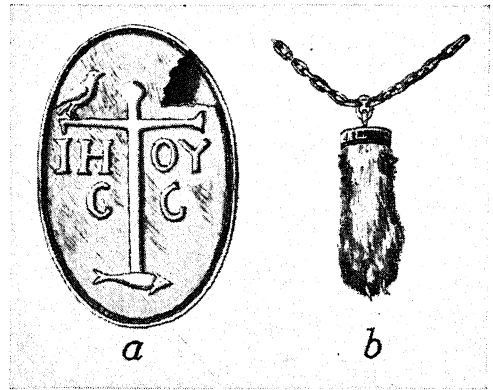
A VIEW OF AMSTERDAM

The canals penetrate to the heart of the city. Canal boats are moored close together.

about ninety islands. The greater part of the city rests on piles, making it a veritable Venice.

Like Venice of old, too, the city's greatness depends on its commerce. Founded in 1240, Amsterdam has long been noted as one of the foremost commercial ports of the world, though its greatness has fluctuated from time to time.

Its harbor on the Y, or IJ, an arm of the Zuider Zee, is supplemented by a canal connecting it with the North Sea. This canal was dredged to an increased depth in 1924. The city is



(a) A medieval amulet.

(b) The rabbit's-foot amulet worn by many superstitious people. (See SUPERSTITION.)

also connected by canal with Helder, at the entrance to the Zuider Zee. It is thus the commercial and industrial center of the country. It has one of Europe's great airports.

The most important industry is diamond-cutting, for which Amsterdam has been noted since the fifteenth century. Diamonds were introduced into Europe at a time when the Dutch controlled the oversea commerce of the world, and naturally found their way first to Amsterdam. In the Jewish quarter of the city the cutting industry sprang up, and the supremacy of its diamond-cutters has never been disputed. Other industries include the manufacture of tobacco, glass, soap, jewelry, linen, silk, and machinery, but the city is of more importance as a trading than as a manufacturing center.

Among the principal buildings are the palace and the New Church, in which the sovereigns of Holland are crowned. Amsterdam is one of the great art centers of the world, particularly famous as the home of Rembrandt (which see). Many of his works, including the celebrated *Night Watch*, so called, are in the Rijks Museum in Amsterdam. There are also many educational institutions, including two universities. Population, about 715,000.

AMSTERDAM, N. Y. See NEW YORK (back of map).

AMU-DARYA, *ah moo' dahr' yah*, RIVER. See ARAL SEA.

AM'ULET, an object usually of stone, metal, or animal skin, with or without figures and words, worn by superstitious people as a charm to ward off sickness, ill fortune, witchcraft, etc. Relics of the saints, herbs, and precious gems have also been used, while the Mohammedans wear a tiny copy of the Koran, hung

round the neck, as an amulet. The peoples of Asia have from ancient times believed in these charms, and still have great faith in their powers. The use of amulets was early forbidden by the Christian Church.

AMUNDSEN, *ah'-mun sen*, ROALD (1872-1928), discoverer of the South Pole, and one of the two men who have viewed both the North and the South poles, was one of the most careful and successful explorers of modern times. His great voyage was begun in 1910, when he set out from Norway in Nansen's ship, the *Fram*, intending to drift for several years across the Arctic seas; but shortly after sailing he changed his plans and headed for the Antarctic regions. Arriving in January, 1911, at the far southern land mass, he determined to set up his camp on the great ice barrier, which had always seemed impassable. Supplies for nine men for two years, together with building material, were hauled to the top of the ice cap, and there was built his headquarters.

With the aid of Eskimo dogs and sledges, three provision depots were established farther south, and with the coming on of the southern winter, men and dogs settled themselves in such poor comfort as was possible. When the weather broke in October, 1911, Amundsen, with four companions, fifty-two dogs, and four sledges, set out for the south over the ice. Latterly

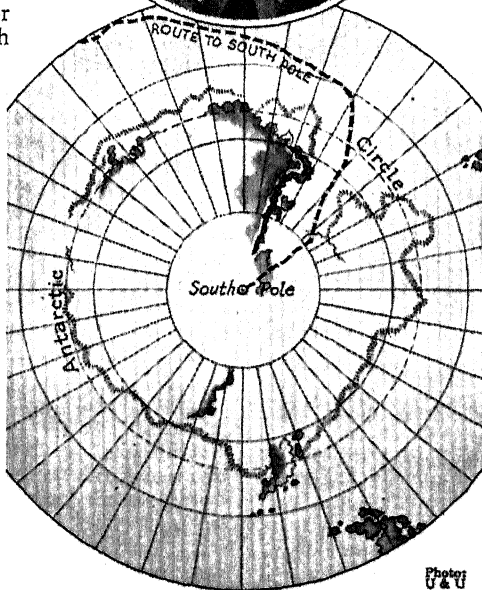
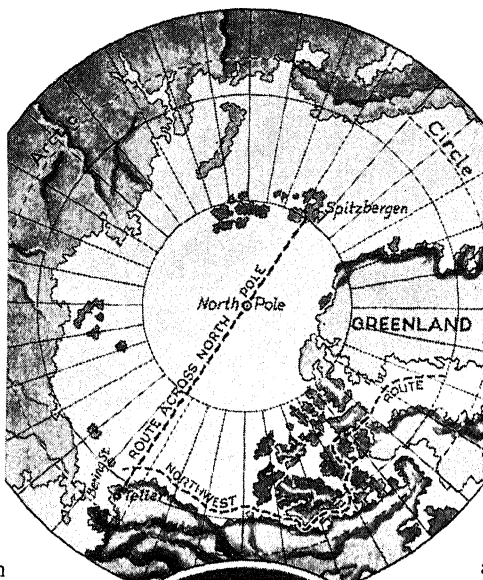


Photo
U & U

they traveled across a plateau 11,000 feet in height, and crossed some very dangerous crevasses, but on December 16 all their hardships were repaid when observations showed that they had reached the South Pole. There Amundsen set up a small tent, with the Norwegian flag floating above it, and it was these landmarks which Scott encountered a month later.

This voyage of Amundsen was merely the climax of a life largely spent in explorations. He was born at Christiania, now Oslo, studied for the navy, and in 1897 went on an Antarctic exploring trip as first mate of the *Belgica*. It was in 1903 that he undertook his first independent expedition, which had two objects: the locating of the north magnetic pole and the discovery of the Northwest Passage, which had been sought since the sixteenth century. After making observations from which scientists afterward worked out the location of the magnetic pole, he pushed from the Atlantic into the Pacific through Bering Strait; and the Northwest Passage (which see) was found. More recent expeditions, including an attempt to fly to the North Pole in 1925, developed the fact that there is no land around the Pole, as many scientists had believed. In 1926, in a dirigible airship, Amundsen and Lincoln Ellsworth, piloted by Captain Nobile, an Italian, crossed the North

Pole from Spitsbergen and landed at Teller, Alaska.

His Tragic End. During the 1926 expedition, Amundsen and Nobile quarreled; it was made evident that the latter, as pilot, endeavored frequently to override the authority of the veteran explorer, and Amundsen in a book published in 1927 severely criticized him.

In 1928 Nobile organized a polar expedition of which he was the head. Disaster overtook the enterprise, and for six weeks it was believed Nobile was dead. Rescue parties sought him; displaying all the finer instincts of humanity, Amundsen volunteered to command one of these. Flying in an airplane with a crew of five men, he was lost in the silence of the Arctic; how he and his companions met their death will probably never be known. Nobile was saved. See pages 142, 143.

AMUR, OR AMOOR, *ah moor'*, RIVER, one of the most important streams of Northeastern Asia. Formed by the junction of the Argun and Shilka rivers, the Amur runs its course along the northern boundary of Manchuria, then turns north and crosses Siberia. Finally, it empties into the Gulf of Tartary, which separates the mainland from Saghalin Island.

The broad valleys of the Amur and its tributaries, the Ussuri and the Sungari, on the south, and the Seya and Bureya, on the north, cover about 770,000 square miles.

The Amur is an important river in commerce. Though its mouths are so choked with sand that goods must be transported by rail for nine miles, it is navigable in a great part of its 2,680 miles of length, from April to November. Khabarovsk, at the point where the river turns north, has rail communication with the port of Vladivostok and the Trans-Siberian Railroad.

AMUSEMENTS. It is not only the children who need play or other relaxation to keep them physically and mentally fit; grown people, those who give up most of their time to work, are no less dependent upon some form of recreation. The man whose work is monotonous and deadening needs play to invigorate his mind; the student or the man of large affairs needs it as a mental rest, as a let-down to a mind too tensely keyed.

There is thus a valid reason for many of the amusements which have been devised in almost infinite number, because different people demand different kinds of recreation. One man delights in games of skill in which he himself may take a part, and a wide choice awaits him—he may “relax” with golf or with tennis, with chess or with whist. Another prefers to watch the skilful moves of others; he spends his summer afternoons at the baseball grounds, or his evenings at vaudeville theaters. The man who devises a popular amusement has

found a sure way of attracting money to his pockets, for the majority of people are more willing to spend money for their recreation than for many other purposes.

Related Topics. A glance at the following list will show something of the number and variety of amusements popular to-day or in some past time. Each topic is given detailed treatment in its alphabetical order in these volumes. In the article **GAMES AND PLAYS**, also, are discussed numerous types of games for children.

Acrostic	Hippodrome
Anagram	Hockey
Angling	Hopscotch
Aquaplaning	Hunting
Archery	Hurdling
Athletics	Ice Yachting
Backgammon	Jackstones
Ballet	Jackstraws
Baseball	Jujitsu
Basket Ball	Kite
Battledore and Shuttlecock	Lacrosse
Bicycle	Lawn Tennis
Billiards	Legerdemain
Bowling	Mah-Jongg
Boxing	Marbles
Bridge	Moving Picture
Bullfighting	Pantomime
Calisthenics	Ping Pong
Camp	Piquet
Canoe and Canoeing	Play
Cards, Playing	Pole Vault
Casino	Polo
Charade	Pool
Checkers	Prize Fighting
Chess	Quoits
Circus	Race
Cockfighting	Radio Communication
Conjuring	Riding
Cribbage	Rouge-et-Noir
Cricket	Roulette
Croquet	Rowing
Curling	Shot, Putting the
Dancing	Shuffleboard
Delsarte System	Skat
Dice	Skates and Skating
Discus, Throwing the	Ski
Dolls, Paper	Snowshoe
Dominoes	Solitaire
Dumb-bells	Swimming
Euchre	Tennis
Fandango	Theater
Fencing	Tobogganing
Fives	Top
Football	Tournament
Games and Plays	Trolling
Golf	Vaudeville
Gymnastics	Whist
Hammer, Throwing the	Wrestling
Hand Ball	Yacht and Yachting
Harlequin	

AMYLOPSIN, *am i lop' sin*. See **PANCREATIN**.

AMYNTAS, *a min' tahs*. See **PHILIP II** (Macedon).

AMYTIS, *a mi' tis*, the Median wife of Nebuchadnezzar. See **BABYLON** (Hanging Gardens).

ANABAPTISTS, *an a bap' tists*, a Christian body of Reformation days, who did not believe in infant baptism, and therefore newly baptized all who joined them. Those outside the group regarded this as a second baptism, and called them Anabaptists, or “rebaptizers.” They were most active in Switzerland, Germany, and the Netherlands, and about 1532

they set up in the German city of Münster the "kingdom of the New Zion." The city became the scene of cruelty, fanaticism, and crime, and in 1535 was taken by the Protestant princes. The leaders of the sect were cruelly tortured and then killed, and the Anabaptists do not appear again in history as a distinct body. The modern Baptists are the most important of the religious bodies that reject infant baptism. See BAPTISTS.

ANABASIS, *a nab' a sis*, the name of two famous Greek histories. The first and best known is Xenophon's absorbing story of the campaigns of the Greek mercenaries of Cyrus the Younger against his brother Artaxerxes, the Persian king, and of the fighting retreat of the 10,000 Greeks, under Xenophon's leadership, from Persia to the Black Sea, through Armenia. The other story is Arrian's chronicle of Alexander the Great. See XENOPHON; CYRUS THE YOUNGER.

[*Anabasis* is from the Greek, and means, literally, *a journey upward*.]

ANABOLISM, *an ab' o liz'm*. See METABOLISM.

ANACLETUS II, *an a kle' tus*. See INNOCENT (II); POPE (Anti-Pope).

ANACONDA, *an a kon' dah*, a giant snake belonging to the boa-constrictor family, which inhabits the swamps and rivers of the dense South American forests, chiefly of Brazil and



Photo: U & U

HEAD OF AN ANACONDA

This snake, which is in the Philadelphia zoo, is twenty-three feet in length, and is said to be the largest serpent in captivity. If you care to get a striking idea as to its size, lay on the ground a small rope of the length named, and imagine it to be a writhing, scaly, repulsive reptile, eight to ten inches in diameter along a considerable part of its length, with a pair of evil-looking eyes that never wink.

Peru. It is the largest of all snakes, and grows to a length of from thirty to forty feet. The anaconda is of a dark olive-brown color, with large, oval, black spots along the back, and smaller white spots along the sides. It can climb trees, and is often to be found coiled around a branch,

waiting for its prey. This snake is also a water animal, and its habit of lying in the streams, with only a small part of the head above the surface, has given it the local name of *water-boia*. It feeds on birds, fish, monkeys, and other animals, and will attack human beings when hungry. It has no poison fangs, but kills its prey by crushing it, and then swallows it whole. In a wild state anacondas are known to live comfortably a month or even longer without eating, because they usually gorge themselves at a single feeding. In zoölogical gardens, where small animals are given them, they are fed about once a week. The anaconda is the only large boa which has a vicious temper. See BOA; PYTHON; SNAKE. L.H.

Scientific Name. The anaconda belongs to the family *Boidae*. It is known as *Eunectes murinus*.

ANACONDA, MONT. See MONTANA (back of map).

ANACREON, *an ak' re on* (about 570-490 B.C.), a Greek lyric poet whose smoothly flowing verses were laden with sentiments extolling wine and love. He gained favor with rulers, and except for a period of self-exile with others when the Persians took his native city of Teos, he spent rather a carefree life. His honors continued after death; his likeness was placed upon a coin, and statues were erected to him. The air to *Anacreon in Heaven*, an old British drinking song, was adopted as the tune of *The Star-Spangled Banner* (which see).

ANAEMIA, *an e' mi ah*, a deficiency in the blood of coloring matter known as hemoglobin. A primary anaemia is one in which the deficiency in hemoglobin is due to some cause which cannot be located elsewhere than in the blood itself. The only form of primary anaemia is commonly known as pernicious anaemia. The secondary anaemias are those in which the deficiency can be traced to some cause located outside the blood. Among the secondary anaemias are chlorosis, septic anaemia, or Hunter's anaemia, and anaemia secondary to consumptive malaria, other infections, to various forms of poisoning, to parasites, and those which follow extensive hemorrhages.

Pernicious Anaemia. In this disease there is a great decrease in red blood corpuscles as well as in hemoglobin. In fact, the decrease in such corpuscles exceeds the decrease in hemoglobin. The disease is attended by pallor, and in extreme cases by a mild, light lemon-tinged jaundice. It is a chronic disease with a marked tendency to intermit. During the periods of activity there may be mild fever, delirium, and great physical and mental weakness. These symptoms disappear in great part during the period of intermittence. In many cases there are marked nerve and muscle symptoms, due to disease of the spinal

cord. The present-day treatment of pernicious anaemia consists in the daily eating of liver or taking some potent extract of liver.

Chlorosis, a form of secondary anaemia, characterized by a marked drop in hemoglobin, or blood coloring matter, without a corresponding loss in blood corpuscles. Chlorosis is especially apt to develop in women, but is now becoming rarer than in the past. The principal cause was the wearing of corsets and tight clothing, which constricted the trunk in the liver region. Constipation and lack of exercise in the open air are contributing causes. It is characterized by pallor. In severe cases the skin has a slight yellowish-greenish hue, and from this quality the name, which means *green sickness*, is derived. Other symptoms are weakness and lack of endurance, short-windedness, fatigability, and lack of energy. Chlorosis is curable by wearing loose clothing, eating juicy meats, and especially meats rich in blood, eating greens and other pigmented vegetables, overcoming constipation, and exercising in the open air. Iron in various forms is of service. Other forms of secondary anaemia are cured by removing or avoiding the cause, by eating the foods named above, and by following the suggested rules of hygiene.

Leukemia, a disease characterized by a great increase in the number of white blood cells. Any anaemia which is present in leukemia is secondary, and not of great importance. There are two kinds of leukemia; one is characterized by a great increase in the size of the spleen, the other by an increase in the size of the lymph glands. The former is known as splenic leukemia, the latter as lymphatic leukemia. While leukemia may be acute, it is generally chronic, but it is intermitting, as well. When the disease is active, there is some fever and some delirium, at least in a few cases profound weakness, pain, and a tenderness, or sense of weight, in the spleen. Exposure to X-ray may cause the spleen or the glands to decrease in size, and the leucocytes to decrease in number, but the effect does not persist. There are rather simple blood tests which reveal the presence of leukemia and the several forms of anaemia. W.A.E.

ANAESTHETIC, *an es thet' ik*, the classical spelling of ANESTHETIC (which see).

ANAGRAM, from two Greek words meaning *backward writing*, is the name given a word or words made by changing the order of the letters of another word, phrase, or sentence, so as to form an expression which has a different meaning. For example, the letters of *French Revolution* may be arranged to form the phrase "Violence run forth." This is a good anagram, because it contains the exact letters of the original expression, and is also an apt description of the Revolution.

The making of anagrams was invented by the ancients, and was a popular exercise among the Jews, Greeks, and Romans. The Europeans of the Middle Ages particularly enjoyed this amusement, and in more recent times literary men of note have felt it not beneath their dignity to form pen names out of the letters of their real names, though John Dryden called this "the torturing of one poor word ten thousand ways." Barry Cornwall, poet, is the anagram for Bryan Waller Proctor, and Voltaire is formed from the family name of that French author. One of the best anagrams ever made was formed from the letters in the name of Horatio Nelson, the English hero of the Battle of the Nile—"Honor est a Nilo," a Latin sentence meaning "Honor is from the Nile." Anagram-making is a good mental exercise, and an interesting pastime for those fond of solving puzzles. See ACROS-TIC.

ANALGESIC, *an al jes' ik*. See ANODYNES.

ANALYSIS, *a nal' i sis*, a word derived from the Greek, and literally meaning to *unloosen* or *unravel*, and also to *break up into parts*. The term is used in grammar, philosophy, mathematics, and chemistry.

In Grammar. Analysis is the breaking-up of a sentence into its parts, such as subject, verb, object, and modifiers, with the purpose of showing how the sentence is constructed and what function is performed by each word and phrase. Analysis is a process frequently employed in studying grammar, and is really helpful if it is done not from a mechanical standpoint, but as a real aid in determining relationships within the sentence. It is frequently necessary to decide what particular form of a word to use, by determining the use of the word in the sentence; practice in this form of analysis will help to cultivate a useful habit. Done mechanically, and for its own sake, it is of little use. The formal analysis of a sentence is given below; so complete a process is seldom necessary at one time.

Type Sentence Analyzed. "We think in words, and when we lack fit words we lack fit thoughts."

Classification: Compound, complex, declarative sentence.

First independent clause, *We think in words.*

Second independent clause, *When we lack fit words we lack fit thoughts.*

The two independent clauses are connected by the coordinate conjunction *and*.

First independent clause: Complete subject, *we*; complete predicate, *think in words*. Simple subject, the personal pronoun *we*, unmodified; simple predicate, the intransitive verb *think*; modified by the adverbial phrase of manner, *in words*, *words* being the object of the preposition *in*.

Second independent clause: Complete subject, *we*; complete predicate, *lack fit thoughts when we lack fit words*. Simple subject, the personal pronoun *we*, unmodified; simple predicate, the transitive verb *lack*, modified by the adverbial clause of time, *when we*

lack fit words, and completed by its object *thoughts*, modified by the descriptive adjective *fit*.

Dependent clause. Introduced by the adverbial conjunction of time *when*. Complete subject, *we*; complete predicate, *lack fit words*. Simple subject, the personal pronoun *we*; simple predicate, the transitive verb *lack*, completed by its object, *words*, modified by the descriptive adjective *fit*.

Analysis is frequently recorded graphically by means of a diagram. See SENTENCE (Diagram of a Sentence).

In Philosophy. If we study a subject by recognizing its characteristics, we are analyzing. Consider, for example, glass. It is hard, transparent, thin, and easily breakable; sand is an important element in its manufacture. This is analysis, that is, distinguishing the parts or characteristics of a subject. The same process may be applied to any subject under discussion. The opposite is *synthesis*; for example, we may say that this substance is hard, transparent, and easily breakable—therefore it is glass.

In Mathematics. Euclid says that "analysis is the obtaining of the thing sought by assuming it and so reasoning up to an admitted truth." Analysis is of little importance in elementary mathematics, all of which is done by reasoning from the known to the unknown. Originally, all propositions in geometry, for example, were solved by analysis, but now the method employed is to work from an axiom, or known truth, to a new and more specific application. Algebra is partly, at least, analytic, for the solution of an algebraic equation means that unknown quantities become known.

In Chemistry. Chemical analysis is the process of separating a compound into its parts. If this process is to determine what elements the compound contains, it is *qualitative analysis*; if it is to determine how much of each element is present, it is *quantitative analysis*. Thus by the first process we learn that water is a compound of hydrogen and oxygen, and by the second that it consists of one part of hydrogen by weight to eight parts of oxygen, or one part of oxygen by volume to two parts of hydrogen; because of these proportions by volume, the chemical symbol for water is H_2O . If the analysis shows the elements and the quantities in which they are present, the analysis is said to be *ultimate*, that is, *final*. The chemist, however, may go farther and try to determine in what combinations the elements are present, and what their condition is with respect to the formation of combinations. This is called *proximate analysis*. See CHEMISTRY; SPECTRUM ANALYSIS; see, also, APPRAISAL. E.U.G.

ANAM, *a nam'*. See FRENCH INDO-CHINA.

ANANIAS, *an a ni' as*, a Bible character whose name has come to be used as a synonym for the word *liar*, was a member of the early Church at Jerusalem. He and his wife Sapphira

were struck dead for having pretended that they were bringing the whole price of newly sold land to the Church treasury, when in reality they were keeping part for their own use (*Acts* V, 1-10).

ANARCHISM, *an'ar kiz'm*, a philosophy or theory of life which would free the individual from every form of restraint or compulsion, whether political, religious, or social. Politically, anarchism denounces all government as evil. Unfortunately, this theory has sometimes led to violence and murder. Men of weak intellect, unable to see that the death of a king or a president could not change the social order, have murdered rulers and paid the penalty with their own lives. In popular language, therefore, anarchism is almost synonymous with disorder of every kind. But the philosophical anarchist refuses to acknowledge any connection with men who resort to crime in their attempts to overthrow the present form of society. To him, anarchy is the perfect social order, in which every human act is voluntary.

Anarchism vs. Socialism. Anarchism is sometimes confused with socialism. Only in one respect are anarchism and socialism alike—both demand the abolition of private property, especially in the means of production, to the end that competition shall give way to co-operation. It is in the means to this end that anarchism and socialism widely differ. The socialist believes that this condition will arise when all industry is controlled by the state, which is the expression of the popular will, and the rewards are equally distributed. The anarchist, on the other hand, opposed to government, believes that production should be carried on by people formed into small groups, in which they work in co-operation, because it is to their individual interests, and because they want to work together, each person producing according to his powers and receiving according to his needs.

Socialism, it is claimed, would decrease the importance of the judicial powers of the state, because it would abolish private property. Socialists say that most of the civil and criminal cases tried in the courts arise from private property. The administrative powers, on the other hand, would be greatly increased, for the state would control all industry and regulate the functions and privileges of the individual. This system is as hateful to the anarchist as the existing capitalist form of organization. The anarchist believes that the power of the state is not to be preferred to the power of capital.

The philosophy of anarchism has made less progress in America than in Europe. Its principles are represented to some extent, however, by the Industrial Workers of the World (see that title).

There are, in fact, relatively few unqualified advocates of the old type of anarchism in the world to-day. In the last few decades there have arisen, especially in Europe since the World War, certain other social, economic, and political doctrines which generally occupy positions somewhat intermediate between socialism and anarchism, or overlap them. Such doctrines are represented by bolshevism, communism, and syndicalism (see these titles in these volumes).

L.L.B.

ANASARCA, *an a sahr' kah*. See DROPSY.

ANATOLIA, *an a toh' le ah*, an ancient province coextensive with old Asia Minor (which see), for centuries the westernmost, most populous, and richest section of the Turkish Empire, now the National State of Turkey. See TURKEY.

ANATOMY, *a nat' o mie*, the science which treats of the structure of animals and plants. The name comes from a Greek word meaning *dissection*, for the principles of anatomy have been learned through the cutting apart, or dissecting, of plant and animal organisms. [This article treats only of animal anatomy. For plant anatomy, the reader is referred to BOTANY and the accompanying index.]

Animal Anatomy. Under this heading are included animal anatomy proper (see ZOÖLOGY) and *human anatomy*, which deals with the structure of human beings. Upon human anatomy depends the successful application of medicine and surgery, especially the latter. No surgeon would dare perform an operation if he did not know thoroughly the position and structure of the organ to be operated on. The science of human anatomy, helped out by all that has been learned of the structure of the lower animals, has reached a high degree of perfection in all medical colleges. Indeed, so complete has it become that it is divided into many smaller branches, such as abdominal, respiratory, and brain anatomy. A surgeon may perfect his knowledge of any of them, while having only a general knowledge of the others.

A distinction is made between anatomy and physiology (which see). While anatomy deals with body structure, physiology has to do with the functioning of the various organs and tissues of the body. The latter is based upon anatomy, for a study of organic processes implies a knowledge of how the organs are formed.

Development of Anatomical Knowledge. In ancient times it was generally believed that the body after death was a sacred thing, and to cut it in any way was to commit a serious crime. Thus, it is not strange that before the Christian Era little was known of the way the human system is organized. The Greeks, it is true, did permit an occasional dissection, after the fifth century B.C., and Galen, in the

second century A.D., made real advances in the science of anatomy, but it was not until the fourteenth and fifteenth centuries that it became clear that the art of healing could not advance far unless dissection was practiced. The rulers of leading European nations ordered a certain number of dissections in the medical schools each year, and the results soon were shown in such wonderful discoveries as Harvey's tracing of the circulation of the blood.

Such tremendous advances have been made in the knowledge of anatomy since ancient times that now the pupil in grammar school, with his pictures and colored drawings of the different parts of the body, knows more about the structure of that wonderful organism than the wisest of the ancient Greeks, such as Plato and Aristotle, ever dreamed of.

K.A.E.

Related Subjects. The following list of articles in these volumes dealing with anatomical matters will be interesting and helpful to the reader who desires to gain a detailed knowledge of the science. No attempt has been made to separate physiological topics from anatomical, because of the interrelation of these subjects.

Abdomen	Larynx
Absorption	Life Extension
Adam's Apple	Ligament
Adenoids	Liver
Alimentary Canal	Lungs
Aorta	Lymph
Appetite	Mastication
Arm	Membranes
Arteries	Metabolism
Assimilation	Mouth
Biceps	Mucus
Bile	Muscles
Blood	Nails
Blood Pressure	Nerves
Blushing	Nervous System
Bone	Nose
Brain	Nutrition
Breath and Breathing	Palate
Capillaries	Pancreas
Cartilage	Pelvis
Cell	Peptones
Chest	Pericardium
Chyle	Peritoneum
Chyme	Perspiration
Cilia	Pharynx
Diaphragm	Pleura
Digestion	Pulse
Ear	Reflex Action
Embryo and Embryology	Saliva
Eye	Scalp
Face	Secretion
Fat	Senses, Special
Fatigue	Sinus
Foot	Skeleton
Gall Bladder	Skin
Glands	Sleep
Hair	Smell
Hand	Sneezing
Head	Snoring
Health	Solar Plexus
Health Habits	Spinal Cord
Heart	Spleen
Histology	Stomach
Immunity	Taste
Intestine	Teeth
Joints	Tendons
Jugular Vein	Thirst
Kidneys	Thoracic Duct
Lachrymal Glands	Tissue
Lacteals	Tongue

Tonsil
Touch
Trachea
Urine
Veins

Villi
Vision
Vivisection
Voice

A large number of articles on related topics will be found listed in the indexes accompanying the articles DISEASE, MEDICINE AND DRUGS, and SURGERY. See, also, EVOLUTION (Evidence from Comparative Anatomy).



Photo: Visual Education Service

SACRED RITES IN CHINA

Chinese children praying before tablets representing their ancestors.

ANAXAGORAS, *an ax ag' o rahs* (500?-428 B.C.), a Greek philosopher, an Ionian, who early moved to Athens and through the influence of his teaching helped to make that city the center of Greek culture, a distinction it retained for centuries. He differed from contemporary philosophers in that he turned from thoughts about things to a consideration of thought itself, and resolved life into the field of speculative inquiry.

He was not ill-equipped for his times in the field of astronomy; the reasons he advanced for the causes of sound, the winds, the rainbow, and of the light of the moon were not far from accurate. Because he ran counter in his deductions to the pagan religion of the times, he was condemned to death, but powerful friends, chiefly Pericles (which see), succeeded in having his sentence changed to banishment; he left Athens after a notable career of thirty years in that city, and settled on the Hellespont.

ANCESTOR WORSHIP. Certain peoples, among whom the most important are the Chinese, have a reverence for the dead members of their families that really amounts to worship. Many Chinese homes to-day have little carved wooden pillars, called ancestral

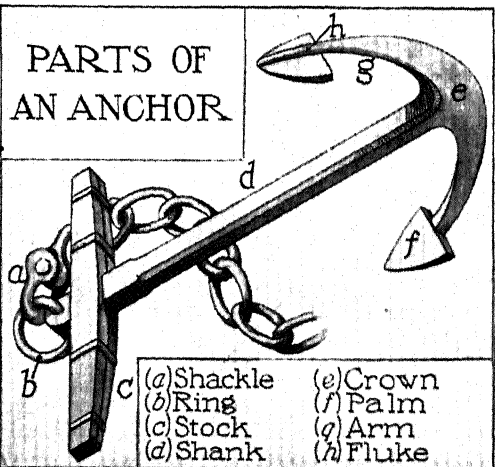
tablets, in which the spirits of the family ancestors are supposed to dwell; and before these tablets incense is burned by the family as before a shrine. Much of the social system of China depends on this ancestor worship, for since only a "man-child" can fittingly do homage to the spirits of his ancestors, every family hopes for sons and regards daughters as encumbrances. Ancestor worship is also common in India and among certain savage tribes, who worship the animals in which they believe their ancestors have taken refuge after death (see TRANSMIGRATION OF THE SOUL). Christianizing influences are slow to effect moral changes in such people.

Such rites appear so strange to people in highly civilized countries that we wonder what causes may be back of them. They are easily understood if we are willing to concede that all human beings realize by instinct that there is some influence above the highest powers of man. This belief is indeed very real; the poet Pope expresses it in the words:

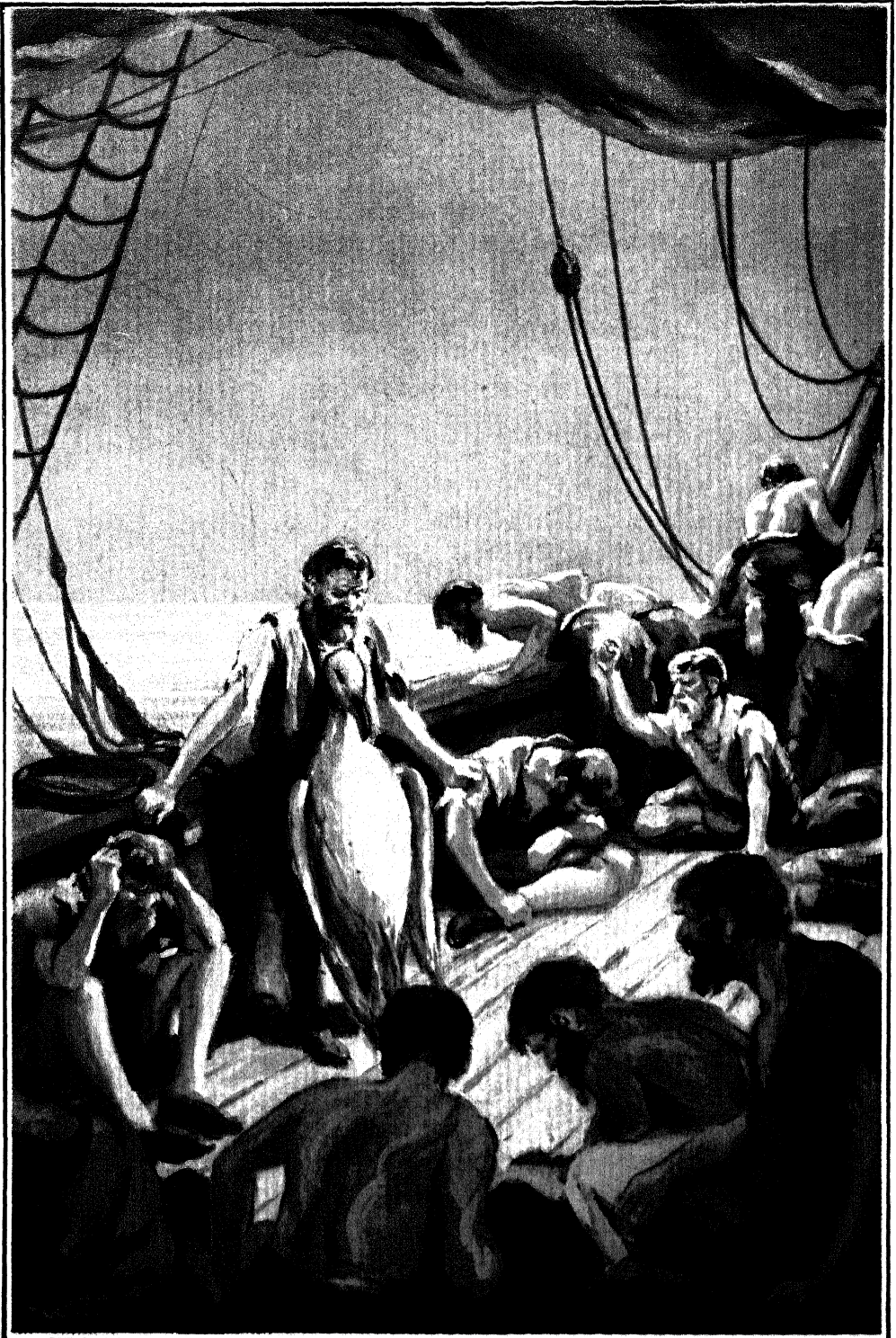
Lo! the poor Indian, whose untutored mind
Sees God in clouds, or hears him in the wind.

To be sure, the savage does not know that it is God he is seeking; it is just something or someone greater than himself. And who is so likely to be this greater person as the father or grandfather to whom all his life he has had to bow down? Fear enters into his worship to a great extent, too, for he believes that his father and his grandfather can punish him from the spirit world for any neglect, just as severely as they did before they died.

ANCHISES, *an ki' sees*. See AENEAS.



ANCHOR, *ang' kur*, an implement nearly always of iron, used to prevent a ship from drifting. It usually consists of a bar, or shank, with two arms, or *flukes*, at the lower end, a cross piece at the top, and a ring to which a



AH! WELL A-DAY! WHAT EVIL LOOKS
HAD I FROM OLD AND YOUNG!

INSTEAD OF THE CROSS, THE ALBATROSS
ABOUT MY NECK WAS HUNG.

—COLERIDGE: *Ancient Mariner*.

cable or chain is attached, for lowering it into the water. When the anchor sinks to the bed of the river or into the sea, one of the flukes is made to sink into the bottom and thus take a secure hold. In some anchors the flukes are loosely bolted to the shaft and turn on the bottom so that both take hold of the earth at once.

Merchant ships do not as a rule carry such heavy anchors as men-of-war, which are provided with two anchors, many tons in weight. A horizontal pull causes the anchor to take a firmer hold in good ground, but in loose soil it may be pulled out by the motion of the ship. When the anchor is *weighed*, it is hoisted to the vessel.

ANCHORAGE, ALASKA, a town described in the article on that territory.

ANCHOR-ICE. See ARCTIC LANDS AND SEAS (Ice Formation).

ANCIENT MARINER, THE, a poem written by Samuel Taylor Coleridge, containing some of the most exquisite poetry in the English language, as well as a beautifully stated moral, expressed in the following words:

He prayeth best, who loveth best
All things both great and small;
For the dear God who loveth us,
He made and loveth all.

It is a story poem, which tells of a sailor who in wanton sport shoots an albatross which has followed his ship, while his companions praise him for his deed. For this they are punished with death, while he meets the worse fate of having to sail "alone on a wide, wide sea," until he feels in his heart love for the moving things he sees about him on the water. Then he is released from his weight of guilt, but is doomed for the rest of his life to seek out men to whom he may tell his story. See ALBATROSS; COLERIDGE, SAMUEL T.

ANCIENT ORDER OF UNITED WORKMEN, a mutual-benefit society, organized in 1868, at Meadville, Pa. Families of deceased members receive a benefit of \$2,000. The highest governing body of the society is the "supreme lodge"; this controls the "grand" or "state" lodges, and these in turn direct subordinate lodges. The organization has a total membership of more than 350,000, and has expended about \$275,000,000 in benefits. See FRATERNAL SOCIETIES.

ANCUS MARTIUS, *an' kus mar' shi us*. See ROME (The Period of Legend).

ANDALUSIA, *an da loo' shi ah*, a general term applied to Southern Spain. See SPAIN.

ANDALUSIANS, a name once applied to some of the Moors (which see).

ANDANTE, *ahn dahn' tay*. See MUSIC (A Course of Lessons).

ANDANTINO, *ahn dahn te' no*. See MUSIC (A Course of Lessons).

ANDERSEN, HANS CHRISTIAN (1805-1875), one of the best-loved writers of children's stories, known the world over as the author of *The Ugly Duckling*, *The Fir Tree*, *The Constant Tin Soldier*, and other tales no less delightful. He was a strange man, and had in some ways a strange life. Born at Odense, in Denmark, into a poor home, he grew up with little education and almost no home training; but he acquired, through going to see every play of the traveling companies who visited his town, a great love for the theater. In 1819 he went to Copenhagen, determined to be an actor, and visited one theater after another, without success. Finally, kind friends became interested in him, sent him to school, and supported him while he began to write plays which he thought would very soon make him famous.

It was not until he began to write travel stories, however, during his journeys in Germany and Italy, that people paid any particular attention to him; and not until 1835, when his first volume of *Fairy Tales* appeared, did he really become famous. More of these tales were published from time to time. While his other works, such as the novels called *The Improvisatore*, *O. T.*, and *Only a Fiddler*, and his *Life's Romance* were highly praised, it was for the charming fairy stories that grown people as well as children waited most eagerly.

It is pleasant to know that Andersen's greatness was fully acknowledged before his death, and that during his last years he had honor and happiness enough to make up for the misery of his early life. The king and queen of Denmark were proud to call him their friend, and famous people in every country loved and respected him. When he died, men, women, and children all over the world were as sorrowful as if they had lost a personal friend.



Photo: Brown Bros.

HANS CHRISTIAN ANDERSEN

[His *Ugly Duckling*, probably the most famous of his stories, is given in full in the article STORY-TELLING.]

ANDERSON, IND. See INDIANA (back of map).

ANDERSON, MARIE ANTOINETTE (1859-), commonly called MARY ANDERSON, was for many years one of the most popular of American actresses. Though she retired from the stage in 1890, after a career of only fifteen years, so extraordinary was her art that her fame will long survive. She was educated in a convent, then studied for the stage under the guidance of Charlotte Cushman (which

see), and made her first public appearance in 1875. In 1890 she married Antonio de Navarro, soon thereafter retired from the stage, and made her home in England.

Her Career. As Juliet in *Romeo and Juliet* and Rosalind in *As You Like It*, she achieved early distinction; later as Meg Merrilies in *Guy Mannering*, Perdita in *A Winter's Tale*, Galatea in *Pygmalion and Galatea* (written by W. S. Gilbert), she maintained her high standards and strengthened her art. After retirement, she wrote her *Memoirs*, and in 1911 assisted in the dramatization of *The Garden of Allah*, which was produced on a sumptuous scale.



Photo: Brown Bros.

MARY ANDERSON

This picture represents her as she appeared when the idol of the theatrical world.

ANDERSON, ROBERT. See FORT SUMTER.

ANDERSON, S. C. See SOUTH CAROLINA (back of map).

ANDES, *an' deez*, called in Spanish CORDILLERA DE LOS ANDES, or simply CORDILLERAS, a great mountain system of South America, the backbone of the continent. The Andes lie on or near the west coast, and extend from Cape Horn, at the south, to the Isthmus of Panama and the Caribbean Sea, at the north. Taken as a whole, they comprise by far the highest mountain mass on earth; there are occasional breaks or divisions, but the total length of this system, 4,500 miles, far exceeds that of any other in the world. This is about 500 miles longer than the Rocky Mountains system of North America, and is more than twice the distance from London to Constantinople. The Andes are characterized by unusually high relief, and have a maximum width of 500 miles, about the same as that of the Rockies.

Divisions. The Andes may be divided into three sections, the Southern, Central, and Northern Andes. The Southern Andes consist of a lofty main chain, with a minor range running parallel to it on the east. They extend from Tierra del Fuego and the Straits of Magellan northward, and rise to their highest point, 23,080 feet, at the summit of Aconcagua, not far from Santiago, the capital of Chile. This is the loftiest peak on the American continents. See ACONCAGUA.

Northward lies the double chain of the Central Andes, where the mountain system is at its broadest. Between the two great ranges are the wide, elevated plateaus of Peru and Western Bolivia. These plateaus are more than 12,000 feet above sea level. There are also several lofty peaks, among them Sorata, or Illampu (21,500 feet), Illimani (21,192

feet), and Sahama (21,047 feet). Farther north, the two mountain ranges draw together, the plateau becomes narrower, and finally the two parallel chains are so close together that they form one elevated mass. In this section the loftiest summit is that of Chimborazo (20,498 feet), formerly thought to be the highest in South America. Cotopaxi (19,613) is another famous peak. See COTOPAXI; CHIMBORAZO.

The Northern Andes break into three distinct ranges, none of whose peaks are as lofty as those to the south. The westernmost range, called the *Cordillera Occidental*, runs parallel to the coast northward through Colombia to the Isthmus of Panama. To the east, and separated from the *Cordillera Occidental* by the narrow valley of the Cauca River, is the *Cordillera Central*, one of whose peaks is the famous volcano of Tolima (18,325 feet). Farthest east, and extending northeastward into Venezuela, is the *Cordillera de Bogota*. There are many peaks of 15,000 feet or more in the Northern Andes, but only one, Santa Marta, over 19,000 feet.

Volcanoes and Earthquakes. All the loftiest peaks are either active or extinct volcanoes, and their cones give the characteristic appearance to the landscape. The group in Ecuador, including the active Cotopaxi, Tunguragua, and Sangai, has been called the most imposing collection of active and extinct volcanoes on earth. All the districts of the Andes system have suffered severely from earthquakes, and many towns have been entirely wiped out. Valparaiso, Lima, Callao, Quito, and Arequipa have been severe sufferers.

Glaciers, Lakes, and Rivers. Glaciers exist on nearly all of the highest peaks, even at the equator; the largest are in Southern Chile, on

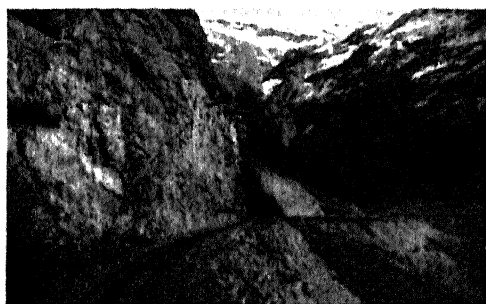


Photo: Visual Education Service

ACROSS THE HIGH ANDES

This railroad crosses the range from Argentina into Chile at a height of many thousands of feet.

the Pacific slope of the range. Both slopes of the Andes, but especially the western, are steep, and in the south many of the glaciers descend so rapidly that they have cut down the mountains far below sea level, thus producing a coast like that of Norway, with many

deep fiords and rocky islands. Many of the glaciers in ages past actually cut their way back by erosion over the crest of the range, so the rivers which rise from them flow from the east side of the Andes through depressions to the Pacific.

The rivers of the western slope are mostly short and rapid, but they have little volume, for the western slope, except near the equator, has little rain. On the eastern slope, however, rise two of the greatest river systems of the world, the Amazon and the Plata, and in the Northern Andes a third great river is the Orinoco.

One of the most remarkable features of the Andes is a great section lying between the two ranges of the Central Andes in Bolivia and Northern Argentina. This is a semi-desert region, at an altitude of about 13,000 feet, without drainage either to the Pacific or the Atlantic. Here is the famous Lake Titicaca, with an outlet to Lake Poopo, which once emptied into the Amazon system. The level of Lake Poopo fell below its outlet, and it now loses its surplus waters only by evaporation.

Natural Resources. The Andes have large deposits of gold, silver, tin, lead, iron, platinum, and quicksilver. The name Andes is derived, by some authorities, from *anti*, the native Peruvian word for *copper*, which is plentiful in the range. The plant life, except in the higher altitudes, is like that found elsewhere in South America. The Andean rose, like the Alpine rose, is a famous mountain flower. The animal life shows great variety, including such South American animals as the llama, chinchilla, condor, and vampire bat.

[For further details, see **SOUTH AMERICA**; also each of the countries crossed by the Andes. In these the plant life and animal life of the various sections of the great range are discussed.]

Communication and Travel. Unlike the Alps, in Europe, the Andes are not traveled by many people. There are few railroads and few established routes, and the wagon roads are almost invariably poor. The inhabitants on the east and west slopes have little intercourse with each other; there are numerous passes over the mountains, but most of them are narrow, steep, hard to cross, and some-

Outline on the Andes

1. Location and size
 - (a) West coast of Southern America
 - (b) Length—longest mountain system in the world
 - (c) Average width
 - (d) Average altitude
 - (e) Comparative height
2. Divisions
 - (a) Southern Andes
 - (b) Central Andes
 - (c) Northern Andes
3. Special features
 - (a) Volcanoes and earthquakes
 - (b) Glaciers
 - (c) Rivers
 - (d) Lakes
4. Resources
 - (a) Minerals
 - (b) Vegetation
 - (c) Animal life
5. Communication
 - (a) Few routes
 - (b) Poor roads and dangerous passes
 - (c) Railways in Central Andes
 - (d) Railroad between Buenos Aires and Santiago

times really dangerous because of heavy winds. Nearly all of these passes cross at right angles to the main axis of the Andes. Other factors contributing to lack of communication have been the sparsity of population and the similarity of products on the two slopes.

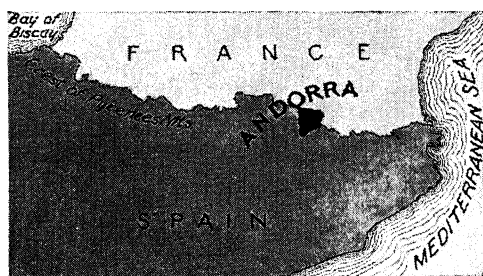
In the Central Andes, the broken character of the range has made it possible to connect the great interior plateau and the coast by two lines of railway, both of which cross the mountains at an altitude of about 15,000 feet. Here, too, there are more roads and trails than elsewhere in the Andes. Nearly all of the roads leading from

the coast, however, end near the summit, and on the eastern slope, where the Madeira and the Plata rivers rise, there is virtually no method of communication. There is a short line of railway, 260 miles long, from Arica, Chile, to La Paz, Bolivia. A more important line from Buenos Aires, Argentina, to Santiago, Chile, was completed in 1909, over the Uspallata Pass. Short branches from this line have been constructed, and others are under consideration. Almost all transcontinental travel goes over Uspallata Pass, whether by train or wagon. At the summit of the pass stands the monument of Christ, erected by Argentina and Chile to mark the settlement of their boundary dispute. See **ARGENTINA**, for illustration of this notable piece of statuary. E.D.F.

ANDORRA, *an dawr' rah*, or *an dahr' rah*, a republic which is indicated on maps merely as a speck of color. It lies among the Pyrenees Mountains, about eighty miles west of the Mediterranean Sea, and is on the boundary between France and Spain. Andorra is one of the famous midget nations of the world. In population it is the smallest, numbering about 5,200 people. In area it is the fourth smallest, yet it covers but 191 square miles; even smaller are Liechtenstein, Monaco, and San Marino.

[Each of the smaller states is described in its place in these volumes.]

Next to San Marino, which claims to have been founded in the fourth century, Andorra is the world's oldest republic, for it received



LOCATION MAP

The map shows the position of the little republic, which relies on both France and Spain for protection.

its independence from Charlemagne, in return for help given him against the Moors. The people are gentle and peace-loving; their chief occupation is the raising of sheep and cattle.

The republic is governed by a council of twenty-four members, four from each of six parishes, who serve for four years. There are two judges, one appointed by the French government and one by the bishop of Urgel, in Spain, in whose diocese Andorra lies. In criminal cases the decision of the judges is final, but in civil cases appeal may be taken to the Court of Cassation at Paris, or to the ecclesiastical court at Urgel. Every able-



GOVERNMENT HOUSE

The home of Andorra's law-making body, the House of Representatives. It typifies the simplicity of the life of the people.

bodied man in Andorra is liable to military service. The capital of the republic is the village of Andorra, with a population of about 1,000.

France and Spain have set up virtual protectorates in Andorra, and both are jealous of their prerogatives in the republic, but as a

matter of fact, there could be but little advantage to either in exercising political control. This is understood by both, and it serves to assure Andorra that there is little danger of annexation by either power. The currency used is that of France and Spain, and the language of the two countries is spoken. See CHARLEMAGNE.

R.H.W.

ANDRÉ, *ahn' dray*, or *an' drie*, JOHN (1751-1780), a British officer hanged as a spy by the American Revolutionary army because he was the messenger of General Clinton in the negotiations which were to have led to the surrender of West Point by Benedict Arnold. Like Nathan Hale, the famous American spy, Major André was a man of the most attractive personality. Handsome, witty, literary, musical, he was one of the most popular men in the British army. His youth, his calmness and courage in the face of death, his innocence of any wrong-doing—he obeyed orders, though personally opposed to the negotiations with Arnold—make him one of the most pathetic figures in the Revolutionary War. Even Washington, who ordered him tried by court-martial, admitted that he was "more unfortunate than criminal."



JOHN ANDRÉ

Military law, however, made his execution inevitable. Sir Henry Clinton had chosen André, his personal aide and the adjutant general of the British forces in America, to secure from the traitor Arnold the plans of the fortifications at West Point. André was conveyed up the Hudson River on a British sloop, and secretly met Arnold on shore. While the conference progressed, the guns of the fort were turned on the ship, which was forced to retire, leaving André in the American lines.

Against Clinton's orders, André discarded his uniform and attempted to reach New York, the British headquarters, in civilian dress. Near Tarrytown, only a few miles from the British outposts, he was stopped by American militiamen, who refused to honor his pass signed by Arnold; they searched him, and in his boots found plans and other papers in Arnold's handwriting. André was taken to the nearest officer, who was indiscreet enough to notify Arnold, thus giving the latter a chance to escape. André was tried by military court, and was hanged on October 2. See ARNOLD, BENEDICT; SPY.

ANDRÉE, *ahn' dray*, SALOMON AUGUST (1854-1897), a distinguished Swedish civil engi-

neer and scientific aeronaut, who sacrificed his life in an attempt to reach the North Pole in a balloon. He constructed a balloon that was buoyant enough to carry three persons, with provisions and apparatus. On July 11, 1897, Andrée, with two companions, left Spitsbergen on the expedition. The balloon carried thirteen buoys which Andrée planned to drop at intervals. Five of these eventually came to shore near Spitzbergen, but of Andrée and his companions no trace was found.

ANDREW. See APOSTLES.

ANDREYEV, *an' dra ef*, **LEONID.** See RUSSIAN LITERATURE.

ANDROCLES, *an' dro klees*, **AND THE LION.** See LION (In Story, Art, and History).

ANDROMACHE, *an-drom' a kee*, in Greek mythology, the wife of Hector of Troy. In Homer's *Iliad*, she is one of the most attractive women of antiquity. The passages describing her parting with her husband when he was setting out for his last battle, and her grief at his death, are among the most pathetic in all literature. After the fall of Troy, she was taken to Greece by the son of Achilles. See HECTOR; TROY; ILIAD.

ANDROMEDA, *an-drom' e dah*, one of the favorite heroines of Greek mythology. Her mother, Cassiopeia, wife of the Ethiopian king Cepheus, boasted that Andromeda was more beautiful than the Nereids, and the offended sea-goddesses induced their father to send a frightful monster to ravage the coasts of Ethiopia. To secure the country from destruction, Andromeda was chained to a rock to be devoured by the monster, but was rescued by Perseus (which see). After her death she was changed to a constellation, which may be seen in the northern sky.

Ethiopia actually existed; the southern part of it became Abyssinia, which in 1923 again became Ethiopia. See CASSIOPEIA; NEREIDS; MYTHOLOGY; page 4867.

ANDROMEDA, a constellation. See ASTRONOMY (The Stars and Their Names); STAR (Stars in Space).

ANDROS, *an' drahs*, **SIR EDMUND** (1637-1714), an English colonial governor in America, whose devotion to the interests of his king brought him often into conflict with the colonists. As governor of New York from 1674 to 1683, he made an excellent record. In 1686 he was appointed governor of New England, which had just been made a single province

under the name "Dominion of New England." The colonists, angered by this consolidation, refused to recognize the new governor's authority. Andros then made a journey to Hartford to demand Connecticut's charter, but, according to the story which was long believed, this document was hidden in a tree which has ever since been called the Charter Oak (which see). In 1688, when news of the revolution in England reached the colonies, Andros was imprisoned by the citizens of Boston, and was even ordered to England to answer charges of tyranny; no formal trial was held. Andros returned to America in 1692 as governor of Virginia. Here he served for six years, and was very popular.

ANDROS ISLANDS. See BAHAMA ISLANDS.

ANDROSCOGGIN, *an drahs kah' gin*, **RIVER.** See MAINE (Lakes and Rivers).

ANEMIA, *a ne' mi ah*. See ANAEMIA.

ANEMOMETER. See WIND.

ANEMONE, *a nem'-o nee*, from a Greek word meaning *wind*, is the commonest name of those flowers which are also known as *wind flowers*; and it is believed that both names were given to the plants because they seem to grow best in a breezy location. Best known of all the species is the delicate *wood anemone*, whose frail white blossoms are favorite spring wild flowers. Some anemones are garden or hothouse plants that produce beautiful blue, red, or pink blossoms, and many cultivated varieties are "double," like the rose. A species known as the *pasque flower* has been adopted as the state flower of the state of South Dakota. B.M.D.



WOOD ANEMONE



Scientific Names. The anemones belong to the buttercup family, *Ranunculaceae*. The wood anemone is *Anemone quinquefolia*; the pasque flower is *A. patens* (variety *Nuttalliana*).

ANEROID, *an' ur oid*, **BAROMETER.** See BAROMETER.

ANESTHESIA, *an es the' si ah*, **CONDUCTIVE.** See DENTISTRY.

ANESTHETIC, *an es thet' ik*, a substance used in producing anesthesia; anesthesia means

absence of sensation. The ability to produce anesthesia ranks as one of the greatest of medical discoveries. Prior to its discovery, surgery was of limited use, because of the great pain and the profound shock occasioned by surgical operations.

In 1800 Sir Humphry Davy suggested that nitrous oxide (laughing gas) might be used in surgical operations, but this idea was not applied until 1844, when Horace Wells, an American dentist, employed it successfully on himself, undergoing anesthesia while having a tooth pulled. Two years previously, Dr. Crawford W. Long, of Georgia, performed the first surgical operation on a patient made unconscious by ether vapor. Dr. Long did not publish the facts of this achievement, and credit for the discovery was long given to W. T. G. Morton, a Boston dentist, because he brought ether into general professional use. In 1847-1848 Sir James Y. Simpson, a Scotch physician, made known the anesthetic value of chloroform, which he used to allay the pangs of childbirth. Though anesthetic surgical and medical practice had to make its way against prejudice, it soon gained a secure hold in both Europe and the United States. Queen Victoria was one of the first women to benefit from the benumbing effects of chloroform during the ordeal of childbirth.

Types of Anesthesia and Drugs Used. General anesthesia is a condition in which there is general insensibility to pain, heat, and cold, with complete or partial unconsciousness. Local anesthesia is a condition of local insensibility to pain, touch, and temperature, without any general unconsciousness.

The anesthetics employed to produce general anesthesia are nitrous oxide (sometimes called laughing gas), chloroform, ether, and ethylene. The anesthetics used to produce local anesthesia are cocaine, novocaine, and related drugs. Local anesthesia is also produced by such anesthetic agencies as cold-freezing and nerve blocking with salt solutions.

Chloroform anesthesia produces little nausea and disturbance of respiration, and it induces anesthesia rapidly and easily. But it endangers the heart and liver. Ether anesthesia is rather more difficult to induce. It causes acidosis and nausea, and it threatens the kidneys, but it is safer than chloroform anesthesia. Nitrous oxide produces a simple, quickly induced anesthesia, from which recovery is rapid and free from after effects. As commonly used, it is especially suited to dental work and operations around the face, and other short surgical procedures. Ethylene-gas anesthesia is popular at this time. It frees the person concerned from shock and pain, and at the same time does not throw any great strain on the liver, heart, or kidneys, and is not followed by nausea.

Local Anesthesia. This is brought about in the eye and in mucous membranes by the local application of cocaine, novocaine, or some drug of that group. Since these local anesthetics are not absorbed by the skin when local anesthesia other than in the conjunctiva and mucous membranes is desired, either freezing is employed, or some remedy is injected into the skin or just under it, making the use of such injections extensive; even major operations are done without pain or shock and without the constitutional effects or after effects of general anesthesia.

Block anesthesia is a form of local anesthesia. It is brought about by injection into a nerve trunk or into the close vicinity of one. For this purpose, alcohol, salt solution, urea solution, or some local anesthetic is used. If the latter is employed, the amount used is small. Block anesthesia is used for some major operations. Twilight sleep is a form of partial general anesthesia used in childbirth, and occasionally in other operations or painful ordeals. It consists in the injection hypodermically of a mixture of scopolamine and morphine in considerable dose, and repeated until the patient is semi-conscious, semi-delirious, and semi-insensible. While under the influence of these drugs, the subject feels some pain, but is indifferent to it. The method has some advantages, but there are disadvantages that are so considerable as to prevent it from gaining great favor.

Conclusion. While practice varies, the following statements may be accepted as substantially correct:

For operations on the eye and nose, local anesthesia is generally preferred. The same is true of dental procedures. For operations on the throat, general anesthesia is the rule. For operations on the thyroid, local anesthesia is generally employed. Most operations on the chest organs, abdominal organs, pelvic organs, and brain are done under general anesthesia. For operations on the legs and arms, sometimes local anesthesia is used, sometimes general, but probably the latter more frequently than the former.

In obstetrics, chloroform is generally used; twilight sleep is used somewhat more frequently than nitrous oxide. For general anesthesia, ethylene now seems to be more popular than ether. In general anesthesia for operations on the mouth, nitrous oxide is preferred.

W.A.E.

Related Subjects. The reader is referred in these volumes to the following articles:

DRUGS		
Chloroform	Ether	Nitrous Oxide
Cocaine	Ethylene	Novocaine

BIOGRAPHY

Davy, Sir Humphry	Morton, William T.
Simpson, Sir James Y.	

ANGEL, *ayn' jel*, a spiritual being who enjoys immortal life and dwells in heaven as a messenger and minister of God. The angels are considered higher than man, and most religious creeds teach that the faithful of earth become angels after death. There is no



Photo: Visual Education Service

GROUP OF ANGELS

From a painting by Fra Angelico, in the Uffizi Gallery, Florence.

clear teaching in the Bible on the subject, but angels are represented in the New Testament as rejoicing over the repentance of sinners, and the Apostles expected Christ to return upon the clouds of heaven in the company of holy angels. Satan and those who joined him in the rebellion against God are often spoken of as "the devil and his angels." There are frequent references of this kind in the Bible.

ANGELICO, *an jel' i ko*, **FRA** (1387-1455), the common name of the last and greatest of the Italian painters who lived in the period between the Middle Ages and the Renaissance, and the greatest religious painter of all time. He entered the Dominican convent of Fiesole in 1407, and, having taken the name Giovanni, became known as **FRA GIOVANNI DA FIESOLE**. *Angelico*, meaning *the Angelic*, was added later, with reference to his saintly character. It is believed that he had been a professional painter before taking his vows. His talent was considered by him to be a sacred gift, and was used with scrupulous piety throughout his long career as a friar painter. Some critics regard Angelico's figures as lacking in naturalness, but in ability to impart spiritual quality and in harmonious

use of color, he surpasses all other religious painters.

Some of His Work. Representative of his art at its best are the *Coronation of the Virgin*, now in the Louvre; the *Last Judgment*, in the Florentine Academy; and series of frescoes in the Vatican, at Rome, and in the museum of San Marco, Florence. In the latter collection, too, is his well-known *Madonna of the Star*. See **MADONNA**.

ANGELL, *ayn' jel*, the family name of two American educators, father and son, both of whom became university presidents.

James Burrill Angell (1829-1916) is especially remembered for his labors as president of the University of Michigan. While at the head of that institution, he caused it to develop from a school of secondary importance to a position among the greatest American universities. He was born in Rhode Island, was graduated from Brown University in 1849, and after four years of study and travel in Europe, returned to that school as professor of modern languages and literature. In 1860 he became editor of the *Providence Daily Journal*; from 1866 to 1871 he was president of the University of Vermont. In the latter year he went as president to the University of Michigan, where he achieved national fame as an educator. In 1880 Dr. Angell was appointed minister to China. After that he was a member of several international commissions, then in 1897 became minister to Turkey, but the next year he resigned this post and returned to the University of Michigan.

James Rowland Angell (1869-), son of the foregoing, has been president of Yale University since 1921. The younger Angell was born in Burlington, Vermont, his father at that time being president of the state university there. In 1890 he was graduated at the University of Michigan, and thereafter carried on postgraduate work at Harvard, at the universities of Berlin and Halle, and in Paris, Vienna, and Leipzig. In 1893 he was appointed instructor in philosophy at the University of Minnesota. The following year he began a long period of service in the department of psychology at the University of Chicago, becoming head of the department in 1905, senior dean in 1908, and dean of the university faculties in 1911. In 1918-1919 he served as acting president of the university in the absence of President Judson, and was called to Yale in 1921. He has been president of the National Research Council and in 1920 became president of Carnegie Corporation.



Photo: Brown Bros.

JAMES ROWLAND ANGELL

ANGELUS, *an' je lus*, **THE**, one of the most popular and best-loved paintings in the world. It shows a man and woman stopping their work in the field to pray at the sound of the angelus bell in the distant church tower. They are true peasants, types of their class in appearance and clothing, and their reverential

attitude has in it an extreme humility. By his grasp of the principles of drawing in perspective, the artist has given the impression that the field extends back miles and miles to the modest church.

This picture was painted in 1859 by the French artist Millet (which see), and was sold by him for 500 francs (\$100), but so rapidly did it advance in public esteem that \$125,000 was paid for it in 1889 by the American Art Association, which brought it to the United States. In the next year it was purchased by M. Chauchard for \$150,000, and taken back to France, where it now forms one of the ornaments of the Louvre. Although not considered by critics one of the artist's greatest pictures, it has a depth of feeling which goes far toward accounting for its popularity.

The *Angelus Bell* is rung at morning, noon, and night in Roman Catholic countries, and at its call faithful worshipers stop their work long enough to repeat the angelic salutation, or *Ave Maria*. The name is taken from the opening words of the prayer, "*Angelus Domini nuntiavit Mariæ*" (the angel of the Lord declared unto Mary), which is in memory of the annunciation to the Virgin Mary by Gabriel that she should be the mother of Christ.

ANGER IN CHILDHOOD. This is an emotion associated with the instinct of pugnacity, and pugnacity seems to be a manifestation on the part of human beings and the lower animals which has to do with expressing their displeasure when the exercise of any other of the fundamental instincts and emotions is interfered with. Anger results in producing a marked disturbance of the ductless-gland coördination of the body. Anger, although we do not fully understand the mechanism, does in some way upset the chemical balance of the body, causing certain ductless glands, notably the suprarenal gland, to over-secrete, thus contributing to a rise in blood pressure and an intensification of the entire physical mechanism, not to mention the over-excitation of the brain and nerve cells.

Anger thus produces more immediate effects upon the body, more directly influences the health and the physical condition, than acute fear or chronic worry, but in the end these latter states just as truly and unerringly come to affect our mental happiness and physical health.

[Fear in childhood is discussed by the same author, in these volumes, under that heading.]

Anger in children is produced by many and varied causes, and is expressed in a great many different ways. Dealing with this condition, it is important to know so far as possible how a particular case of anger is aroused, as the outburst itself is not so important as its cause. The control of this tendency depends on the development of certain inhibitions and re-

straints, and it is vitally important that they be established in early life.

The child who is chronically irritable and gives way to frequent bursts of temper often develops other defects which will make him a most unhappy and inefficient member of society. Sometimes, these displays of anger are employed by the child to gain his ends—are used as a means of bringing his parents and teachers to time.

The loss of self-control and the exhibition of temper associated with outbursts of anger must be treated by proper educational effort on the part of parents and teachers, and by that is meant that they must explain to the child how these outbursts can easily be controlled by the mastery of the initial mental processes which are responsible for these exhibitions of anger. But we must remember that the child is not in any sense a perfected organism, either physically or psychically, and that the most ideal teaching technique may sometimes fail to get the idea across. There is a hereditary tendency in many cases, and there is often an enfeeblement of inhibition which the ancestors have passed on down to the child, which has to be reckoned with. It is necessary many times to resort to discipline in our efforts to correct and cure these outbursts of temper. Of all punishment, probably the best one is calmly to talk to a child and set it down in a chair for an indefinite period—not for an hour or half an hour, but until such time as it gains control. Tell the child to send for you when he feels he has gained control of himself, and then, after another talk, terminate the sentence of inactivity.

The best way to correct any fault in a child is to put it in the way of cultivating the opposite trait of character. When a child loses self-control, to compel it to sit calmly and think is rational punishment; it is corrective, therefore effective, and it is scientific and sane.

One thing is certain—parents and teachers are not going to accomplish anything by way of correcting temper in a child when they go at it while angry themselves. Example, in such matters, is worth just as much as, or more than, precept.

One is reminded of the story of the little girl who, after being savagely shaken by her mother and scolded for losing her temper, looked up at her mother presently and asked, "Why is it, Mummie, when I lose control it is temper, but when you lose control you call it temperament?"

Before you start out on a program of teaching a child to control its temper, look yourself over and be sure that you are able to go about it in a calm and composed manner. W.S.S.

Related Subjects. The reader has been referred in the above article to a companion article, *FEAR IN CHILDHOOD*.



From the painting by Millet

THE ANGELUS

To the simple material aspect of the story that the picture tells, there is added the deeply reverential note as the peasants bow at the ringing of the distant Angelus.
[The original painting is in the Louvre, Paris.]

Parents who desire to explore further into the problems confronting them in rearing children are referred to the following articles:

Character Training (Thoughtfulness Is Important)
Dishonesty in Childhood
Fatigue and Nervousness in Children
Habits in Childhood, Troublesome
Heredity (Inheritance of Intellectual and Moral Traits)
Mental Conflict, a Cause of Misconduct

ANGINA PECTORIS, *an ji' na pek' to ris*, OR **HEART SPASM**, a pain in the chest, a condition characterized by a pain which radiates from behind the head of the breastbone. Usually the pain shoots to the left, and frequently goes down the left arm. It is accompanied by a feeling of apprehension, which is peculiar to the malady. While the feeling of apprehension is mental, the mind refers it to something behind the head of the breastbone. The apprehension may be present without the pain. The pulse is rapid, and it is usually irregular. The cause of this symptom is a temporary insufficiency of blood supply to the heart muscle. The cause of this is some obstruction in the coronary artery, usually due to disease of the wall itself. This is accompanied by some disturbance of the nerve control of the heart.

Angina pectoris is a disease of men and women beyond middle age. It appears suddenly; oftentimes emotional strain of some sort is the exciting cause, or it may be walking, running, or some exertion which is sufficient to strain the heart muscle. After an attack passes, there may be complete comfort until something precipitates another attack. The intervals between attacks may be days, weeks, or even months.

While angina pectoris may develop in a heart that is organically sound, the rule is that the organ is crippled in some way. The quickest relief from the pain of angina is that which is given by inhaling amyl nitrate. Persons subject to attacks will do well to carry pearls or capsules filled with this liquid. When an attack comes on, a pearl or capsule should be crushed in a handkerchief and the gas inhaled. Other remedies of similar character are slower in action, but the effects persist longer. Heat applied locally may be helpful. To prevent attacks, persons subject to angina should avoid undue emotional strain and undue exertion, and whatever else experience teaches has caused attacks. See **HEART**.

False Angina. Any pain which appears to be located in the chest near the heart may be called angina. Such pains do not radiate, and do not cause the anxiety and evidence of shock and disturbance of circulation which characterize angina pectoris. Nervousness, introspection, neuralgia, and rheumatism are the principal causes of false angina. W.A.E.

ANGIOSPERMS, *an' je o spurmz*. All seed-bearing plants are divided into two great

groups. In one, the seeds are protected by a seed case, and in the other they are naked or exposed. Plants belonging to the former of these two classes are known as *angiosperms*; those of the latter are *gymnosperms*. Angiosperms include plants of all sizes, from the tiniest forms that float about on the water to huge trees. Cone-bearing trees, however, are gymnosperms.

In all seed-bearing plants there is commonly what is called *cross-pollination*; that is, the pollen is carried from the stamens of one flower or plant to the pistils of another. Sometimes this transfer is by the agency of the wind, but in the angiosperms it is mostly accomplished by various insects; and the remarkable development of bright colors and sweet scents in flowers which results in attracting the necessary insects is one of the most interesting of biological relations. The rose, the lily, the orchid—in fact, all the plants which have noticeable flowers, as well as most trees except the evergreens—are members of the angiosperm group. B.M.D.

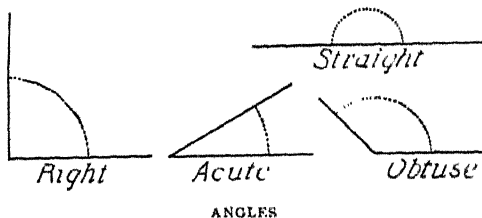
Derivation. *Angiosperm* is derived from two Greek words, and means *seeds in a case*.

Related Subjects. The reader is referred in these volumes to the following articles:

Botany (Classification)	Gymnosperms
Cross-Pollination	Seeds

ANGLE, a word derived from the Latin *angulus*, meaning *corner*. An angle is the figure formed by two lines issuing from a point. The term is sometimes applied loosely to the space between the meeting lines, but is used correctly only as the measure of the difference in the direction of the lines. The corner, or point of meeting, itself is the *vertex*, and the lines are the *sides* of the angle. As the angle indicates merely the difference in direction of the lines, the length of the sides need not be considered.

An angle is measured in *degrees*, a degree being equal to $\frac{1}{90}$ of a right angle. If the



sides of an angle are in the same straight line but on opposite sides of the vertex, the angle is a *straight angle*, of 180° . Two straight angles equal 360° , or a *perigon*. Angles of less than 90° are *acute*; between 90° and 180° , *obtuse*; between 180° and 360° , *reflex*. If the sides of the angle are straight lines, the angle is called *rectilinear*; if they are curved, *curvilinear*.

When a line *OP* issuing from a point *O* rotates in a plane about *O* from any *initial position* to any *terminal position*, one angle is generated, which measures the amount of rotation. Such an "angle of rotation" may have any magnitude, such as 1080° (three complete revolutions), and may be either *positive* or *negative*, according as the rotation takes place in one or the other direction. Rotation in the direction opposite to the motion of the hands of a clock is usually regarded as positive; the clockwise rotation is negative. See GEOMETRY. J.W.V.

ANGLE OF INCIDENCE. See LIGHT (Reflection of Light); REFLECTION.

ANGLE OF REFLECTION. See LIGHT (Reflection of Light); also REFLECTION.

ANGLES, one of the three tribes that invaded Britain during the fifth century and united to comprise the people that formed the English nation. The other tribes were the Jutes and the Saxons. The Angles belonged to the Low German division of the Teutonic peoples, and their original home was the district of Angeln, in Schleswig-Holstein. The name England (Anglo-Saxon *Engla-land*) is derived from the name of the Angles. They were the founders of three kingdoms on the island—East Anglia, Mercia, and Northumbria. C.W.

Related Subjects. For a tribute to the appearance of these northerners, see GREGORY (Gregory I); see, also:

Anglo-Saxons	Jutes
England (History)	Teutonic Races

ANGLEWORM. See EARTHWORM.

ANGLIA, a kingdom organized by the Angles, dating from about the middle of the sixth century. It comprised practically the counties of Suffolk and Norfolk of present-day England. In 654 it fell to Mercia, then to Egbert, king of Wessex, who held it until 825. Alfred the Great gave Anglia to the Danes in 878, but his son and successor, Edward the Elder, recovered the territory when in 921 he forced the Danes to acknowledge him as their chief. It was then made a part of the West Saxon kingdom.

ANGLICAN CHURCH, strictly considered, is the name of the established Church of England (which see). In the broader and more general sense, the Anglican Church, or Anglican Communion, includes not merely the Church of England but the Scottish Episcopal Church, the Church of Ireland, and the Church of England in the British commonwealths. The relations of these branches to each other and to the whole are very loose; as a united body, the Church throughout the world is represented only at the Lambeth Conferences, at which the bishops meet. The Lambeth Conferences, so named from Lambeth Palace, the residence of the Archbishop of Canterbury, only advise; they cannot legislate on matters of doctrine or practice. The Protestant Episcopal Church in the United States, formerly a branch

of the Anglican Church, is now a separate body.

The doctrines of the Anglican Church are contained in the Thirty-Nine Articles, and the ritual is in the Book of Common Prayer. The membership of the Anglican Church is divided into three groups, all of which agree on the tenets of their fundamental belief but differ to a considerable degree on questions of ritual and minor points of doctrine. These groups are called High Church, Low Church or Evangelical, and Broad Church. See THIRTY-NINE ARTICLES.

[In 1927 and 1928, the peace of the Church of England was disturbed by a bitter controversy over the revision of the Prayer Book, representing a divergence of opinion between the Anglo-Catholic, or High Church, party, and those of more liberal views. This subject is treated under CHURCH OF ENGLAND.]

ANGLIN, *ang' glin*, MARGARET (1876-), a distinguished actress of Canada and the United States, was born in Ottawa, Ont.

[Her family is prominent. The father, Timothy W. Anglin, was a New Brunswick journalist and statesman, one of the Liberal leaders in the Dominion House of Commons, and from 1874 to 1878 its Speaker. A son, Francis Alexander Anglin, Margaret's elder brother, born in New Brunswick, was educated for the law, achieved a judgeship in the Ontario courts, and in 1909 became a member of the Supreme Court of Canada.]



Photo: Brown Bros.

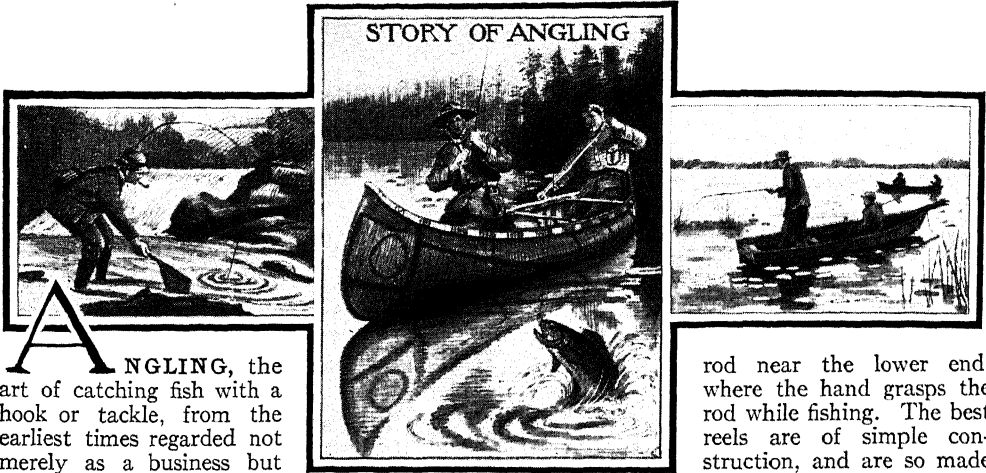
MARGARET ANGLIN

Miss Anglin did not employ a stage name for her career, preferring to be known by her real name. She rose rapidly in her profession, and in succession became leading lady for such great actors as James O'Neill, E. H. Sothern, and Richard Mansfield. By 1905 she was at the head of her own company.

In 1911 she was married to Howard Hull, a dramatic critic, but did not abandon the stage.

Her Career. She played the leading rôles in *Zira*, *The Great Divide*, *The Awakening of Helena Ritchie*, and *Green Stockings*, conventional dramas; in classical rôles she presented English versions of *Antigone* and *Electra* of Sophocles, and the *Medea* and *Iphigenia in Aulis* of Euripides, in these old Greek tragedies winning high praise. In Shakespearean parts she portrayed Katherine in *Taming of the Shrew* and Viola in *Twelfth Night*. Another of Miss Anglin's successes was *The Trial of Joan of Arc*, in which she met all expectations in tragic scenes, but undoubtedly she pleased the majority of play-goers best in comedies such as *Lady Windermere's Fan*.

One of the most prominent actresses that the Dominion of Canada has produced.



A NGLING, the art of catching fish with a hook or tackle, from the earliest times regarded not merely as a business but as one of the most alluring of sports. There are frequent references to this art in Greek and Latin authors; it is mentioned several times in the Old Testament, and ancient mural paintings show that it was practiced ages ago in Egypt. A fisherman may fish for food; his is a vocation. Fishing to an angler is a game; he loves the rush of the brook or the cold blackness of a deep lake; he seeks the odors and the peace of out-of-doors; he craves the excitement of the catch, to test his skill against that of the fish. A perfect angler, says a Greek poet, is "a well-made, active man, patient, vigilant, enterprising, courageous, and full of expedients." Good Izaak Walton, whose little book, *The Compleat Angler*, made him immortal, expressed himself thus:

We may say of angling as Dr. Boteler said of strawberries: "Doubtless God could have made a better berry, but doubtless God never did"; and so, if I might be judge, God never did make a more calm, quiet, innocent recreation than angling.

Rod. The rod, that important part of the angler's equipment, receives his careful attention. Fishing rods are made from numerous materials, and in various weights and styles. The light, one-piece cane rod was once the most popular, but has been succeeded in popularity by the three-piece split bamboo or steel. In many instances, the angler often manufactures his own rod. The jointed rod, which can be taken apart and put together at will, is most frequently, and probably most successfully, used for fresh-water fishing. Whether made of cane, wood, or steel, all fishing rods taper from the butt end, or handle, and possess considerable elasticity. In length they may vary. Bait casting-rods are in lengths from five to six feet; the fly-rod, from seven to ten feet; the heavy and powerful rods now are seldom more than fourteen feet in length.

Reel. The reel, an apparatus for winding up or letting out the line, is attached to the

rod near the lower end, where the hand grasps the rod while fishing. The best reels are of simple construction, and are so made as to run rapidly. Jeweled

bearings are used in one type of reel, and the cranks are so geared that when they are turned once the barrels on which the lines are run turn four times. Other reels are only double-multiplying; that is, the spools revolve twice to each turn of the handle, while trout reels and salmon reels, commonly called "single-click" reels, revolve only once to every turn of the handle. It is not necessary for these reels to be multiplying, as the fish is played by stripping the line and not with the reel, as in bass-fishing.

Line, Hook, and Float. The line is sometimes made of fine braided silk, but as often of twisted linen. Silk lines are never twisted. To the end may be tied a piece of fine gut, on which the hook or hooks are fixed. For casting heavy bait, the line is a little heavier, and the gut leader is discarded. The hook, of finely tempered steel, it is sometimes believed, should readily bend without breaking and yet should retain a sharp point; as a matter of fact, a really good hook will not bend; it should be rigid, without breaking. It should be long in the shank and deep in the bend, and the barb should be long. In size and shape, the hooks must be adapted to the kind of fish that are angled for. In still-fishing from a pier or anchored boat, floats formed of cork and goose or swan quills are often used to buoy up the hook so that it may float clear of the bottom. For heavy fish or strong streams, a cork float is used; in slow water and for lighter fish, a quill float.

Bait. Baits consist of a great variety, natural or artificial. Grasshoppers, worms, and minnows are good bait in trout-fishing, while crawfish, small frogs, and minnows are best for bass. The artificial flies so much used in angling for trout and salmon are made of hairs, furs, and wools of every variety, mingled with pieces of feathers and secured together by plaited wire, gold and silver thread, marking silk, or wax.

The wings may be made of the feathers of domestic fowls, or any others of a showy color. Some angling authorities recommend that the artificial flies should be made to resemble as closely as possible the insects on which the fish is wont to feed, but experience has shown that the most conspicuous combinations of feather and fur have often been successful where the most artistic imitations have failed. Artificial minnows and spoon-shaped pieces of metal are also used by way of bait, and are constructed to spin rapidly when drawn through the water, in order to attract the notice of the fish. Angling, especially with the fly, demands a great deal of skill and practice.

Open and Closed Season. To protect fish from those who would, if unrestrained, exterminate all game fish, practically every state has passed a closed-season law, during which time it is illegal to fish. These laws vary so greatly that it is necessary for the angler to learn the laws which apply to the locality in which he wishes to fish. In some states it is illegal to take fish under certain size or weight, and in almost all states it is forbidden to take trout, bass, and other fish by any method other than with hook and line. The closed season varies with the habits of the fish and the location of the fishing grounds. As a general rule, spawning time is a closed season. In many states fishing is also illegal during the winter months. Non-residents who desire to fish are required to pay a small license fee in many states and provinces. See FISH. S.B.

ANGLO-EGYPTIAN SUDAN, a vast area in Eastern Africa, nominally a part of Egypt, but entirely under control of Great Britain since 1899.

Previous to 1882, the rule of Egypt had gradually been extended southward, but in that year a revolt of the Mahdi (which see) was so successful that his followers for about sixteen years defied the government and blocked the trend of enterprise of white men toward the Upper Nile region. British dreams of southern expansion were halted, and the projected Cape-to-Cairo highway of commerce was jeopardized. In 1896 an Egyptian-British force commenced operations for the recovery of the lost provinces, and two years later the subjugation of the obstructionists was accomplished.

In November, 1899, an agreement was entered into by the Egyptian and British governments, by which the latter was to administer the great territory which had been regained. The northern boundary of the area, thereafter to be known as Anglo-Egyptian Sudan, was fixed at 22° N.; the present confines are shown on the map accompanying the article AFRICA. Not until 1924 was the western boundary definitely described, in which year France and Britain agreed upon the frontier which now

divides Anglo-Egyptian Sudan from French Sudan, or French Equatorial Africa.

The governor-general of Anglo-Egyptian Sudan is appointed nominally by the ruler of Egypt, but actually designated by the English government. The Egyptian and British flags officially are flown together, a fact which emphasizes white domination. Until recently, Englishmen held all offices in the Sudan, but an increasing number of natives are being admitted to administrative posts.

Great Britain must control the Sudan or some day face the possibility of disaster to its African empire; from Egypt, whose foreign policy must be acceptable to the English, to Cape Town, at the southern end of the continent, Britain's communications must be maintained. The Anglo-Egyptian Sudan stretches over 1,100 miles along this highway.

The Sudan is the source of most of the world's supply of gum arabic. Egyptian cotton is successfully grown, and the area devoted to it is constantly increasing through immense irrigation enterprises along the Nile; American cotton has also been introduced. More ivory is exported from here than from any other part of the world.

The People and Cities. The British-controlled Sudan has an area of 1,014,000 square miles, and a population estimated at 5,825,000. Except for the governing class, industrial leaders, and traders from Europe, all are native Egyptians. There are two towns of historic importance:

Khartum', or **Khartoum**, the capital, and at one time its largest town, is situated on the left bank of the Blue Nile, near its junction with the White Nile, and on the Cape-to-Cairo Railway. As the center of the great caravan routes from the interior of Africa, Khartum early became noted for its activity in the slave trade, but to-day it carries on a thriving trade in ivory, ostrich feathers, gums, and senna, which are exchanged for European goods. In 1830 the city was made the seat of the governor-general of the Egyptian Sudan, and it, too, has shared the evil fortune of the Sudan region. In 1885 Khartum was taken by the Mahdi, bent upon the crushing of Turkish rule in the Sudan. The entire British garrison was massacred, including their commander, the heroic General Gordon. In 1898 the power of the Mahdi was broken. Population, 32,000, including, in addition to the natives and several hundred Englishmen, representatives of many races. See GORDON, CHARLES GEORGE.

Omdurman, *om duhr' man*, the capital of the successor to the Mahdi, is a progressive city, considering its location in the heart of the country. It is the trading center of the natives of the Sudan. Population, 80,000; there are few whites.

ANGLO-SAXON CHRONICLES. See article below, subhead.

ANGLO-SAXONS, *ang' glo sax' unz*, the ancestors of most of the English-speaking peoples, a race formed by the union of the German (Teutonic) tribes who settled in Britain in the

fifth and sixth centuries after Christ. The most important of these were the Angles, Saxons, and Jutes. The Jutes, the earliest comers, left their original settlements in the regions about the mouths of the Elbe and the Weser, and took possession of Kent, the Isle of Wight, and the opposite coast of Hampshire. They were followed by the Saxons, who had inhabited the regions along the Baltic Sea, and by the Angles, who came from the territory in North Germany between the North and the Baltic seas.

Before the end of the sixth century, the Angles had conquered Southeastern Scotland and Eastern and Middle England; the Jutes were in possession of Kent and the Isle of Wight; and the Saxons held the remainder of Southern England west to Devonshire and Wales. The conquests of the Angles were the most extensive, and from them England (Engla-land, "land of the Angles") took its name. The various kingdoms established by these conquerors were united into one state in 827 by Egbert, king of Wessex. Athelstan, who came to the throne in 925, was the first monarch to use the title "king of England." About 500 English terms, referring to foods, shelter, and parts of the body, are derived from names of Anglo-Saxon institutions.

Anglo-Saxon Chronicles, a series of four ancient accounts of English history from earliest known time through the Norman Conquest to 1154, of which six manuscripts now exist. They are of first importance for historical knowledge of that country.

Scholars generally believe that Alfred the Great (which see) directed the gathering of local histories into one national chronological narrative, and that after his reign the chronicle found its way to various parts of England, perhaps to monasteries for copying. Each place continued the chronicle in its own way, adding local events and local opinion, resulting in the six differing manuscripts. Each has poems and other items common to all, among them the famous ballad of the Battle of Brunanburh. c.w.

Related Subjects. The reader is referred in these volumes to the following articles:

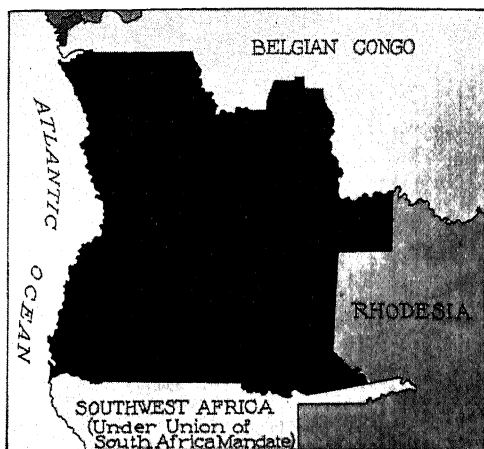
Angles	England (History)	Jutes
Athelstan	Egbert	Teutonic Races

ANGOLA, *an go' lah*, known also as **PORTUGUESE WEST AFRICA**, has belonged to Portugal since 1575, with the exception of the years 1641-1648, when it was held by the Dutch. The government is under a high commissioner, who is invested with wide power. Loanda, officially São Paulo de Loanda, the principal town and seat of government, was long a great Portuguese slave market. This trade was abolished by law in 1836, but was continued in the interior for many years after that date.

The coast line is over 1,000 miles in extent, and the area of the colony is 484,800 square miles. The population exceeds 4,000,000. There are about 800 miles of railroad, extending from Loanda into the interior. There are adequate cable and radio connections.

The chief products are coffee, rubber, sugar, cotton, tobacco, and petroleum.

São Paulo de Loanda, or **Loanda**, the capital and chief city, was for at least two hundred years the center of the slave trade between Portuguese Africa and Brazil. Its present importance arises from the fact that it is the seaport and seat of government. Population, about 25,000.



ANGOLA

Its territory is marked in black. The area is nearly twice that of Texas or of the great province of Alberta. [See illustrations, page 289.]

ANGORA, *an go' rah*, or *an' go rah*, since 1920 **ANKARA**, the capital city of the National State of Turkey. See **TURKEY** (The Cities).

ANGORA GOAT. See **GOAT** (Domestic Goats).

ANGRA, *ahn' grah*, capital of the Azores Islands (which see).

ANGRA MAINYU, *mine' yu*. See **ZOROASTER**.

ANHYDROUS AMMONIA, *an hi' drus a-mo' ni ah*. See **ICE** (Artificial Ice); **COLD STORAGE**.

ANILINE, *an' il in*, a colorless, oily liquid, somewhat heavier than water, is one of the most valuable dyestuff intermediates known. It is made from nitrobenzene, which in turn is obtained from benzene, or benzol, a by-product in the distillation of coal tar. Ordinary commercial aniline turns brown on exposure to air. It has an aromatic odor and a burning taste, and is very poisonous. Several of its derivatives are used in medicine. It is a compound of carbon, hydrogen, and nitrogen.

Aniline Dyes. Aniline was discovered in 1826, but did not become commercially important until thirty years later, when a young English chemist, William H. Perkin, accidentally learned how to make a beautiful violet dye from it, while trying to change the substance into quinine. He was a student in the Royal College of Science at the time, and had fitted

up a home laboratory in which to work during the hours that the college laboratory was closed. His discovery has been of far greater value to the world than the making of artificial quinine would have been.

By constant experimenting, chemists have learned how to produce a wide range of colors of great beauty and fastness. Aniline dyes are now used not only to color textiles, but in the manufacture of ink, varnishes, pigments for paint, feathers, and other articles. Before the World War, Germany had a practical monopoly of the manufacture of coal-tar dyes, but during the war an American industry was built up, and that industry is now on an independent basis. See COAL TAR; DYEING AND DYESTUFFS. T.B.J.

ANIMAL. The simplest forms of animal life consist of one cell only, and look much like the lowest orders of plant life (see CELL). Scientists are unable to tell whether some of these tiny cells are animal or plant. These simple-cell animals have the power to do in themselves, without any special organs, all things necessary for their life. The higher orders of animals are composed of billions of cells, and have many intricate organs, each with its special work to do. For instance, one set of organs is employed in the collection of food, another in its digestion, others in carrying the food through the body, bringing oxygen into the system, or carrying off waste and dead matter. In different animals these organs vary greatly, but their purposes are the same.

No true distinction can be made between plants and animals, even in many of the higher organisms, by form alone. Thus, it is impossible to say that the power of motion belongs only to animals, for some plants can move, and many animals are rooted or fixed.

The great distinction between plants and animals lies in their method of nutrition. Almost all plants (except fungi) feed on inorganic food, that is, food which is neither animal nor vegetable. Animals, on the contrary, require organic, or living, matter, and so are dependent

upon plants or other animals for food. Both plants and animals use the food they secure in building up their bodies, or to provide heat or energy. Oxygen is necessary for the life of both plants and animals, and both give off carbon dioxide as a waste product. This discharge of carbon dioxide from plants is not apparent in the daytime, because they use it

in manufacturing their food (photosynthesis); hence the erroneous notion that plants use only carbon dioxide and give off oxygen. At night, when plants are not manufacturing food, they are using oxygen and breathing out carbon dioxide like the animals. See CARBONIC-ACID GAS, (Interchange Between Plants and Animals); also, CHLOROPHYLL.

As plants and animals become more complicated in structure, the distinctions between them broaden until it is needless to point them out. All the hundreds of thousands of animals which inhabit the globe have been divided according to certain traits or peculiarities into great groups,

which have been again and again subdivided, for no matter how many points of likeness animals have, their differences are even more noteworthy, and but for the characteristics pointed out above, no one would consider placing a sponge and a man together in even the widest of classes.

Even the most superficial study of familiar animal life brings up many questions and leads into most interesting fields of thought. The cat on the back fence, for instance, and the tiger at the zoo—are they really related? They look alike, to be sure, but is the resemblance just superficial, or is it recognized by scientists? Is there any reason why a polar bear is white and the cinnamon bear brown? Why, when fish lay so many eggs, do not the waters of the earth become full of fish? These and many more questions are answered by zoölogists, and are also explained in various articles in these volumes. [Article continued, pp. 290-291.]

[See the article ZOÖLOGY, for a classification of the animal kingdom.]



SCENES IN ANGOLA

Native women carrying corn from the fields. Storage places for corn, made of grass. In Angola, as in other parts of Africa, the women are the workers.

Animal Intelligence and Senses

Occasionally there appears in the papers or on billboards the announcement of the wonderful achievements of an educated horse or dog, and at once the question as to just how much intelligence animals do possess comes to the fore. Some of the actions of animals seem at first sight to argue a high degree of intelligence—the setting of sentries by the wild beasts, the choice of migration routes by the birds, and the almost incredible things which the little hive bee accomplishes. But conclusions must not be reached too quickly—it is unsafe to infer from human-like actions the possession of human reasoning powers. The whole question as to the intelligence of animals really hinges on this: are they capable of reasoning? That is, can they figure out or argue that because this or that is true, some other thing must necessarily be true? And the most authoritative writers on the subject, those who have given the matter sympathetic thought, are inclined to believe that no animal has the ability to put together facts and so work out a conclusion as man can.

Animals have an instinct which directs them under circumstances in which human beings would employ long reasoning processes; and it is probable that when the mother bird "each fond endearment tries, to tempt her new-fledged offspring to the skies," she is not definitely planning for their welfare, but simply following a blind instinct.

Animal Stories. Among the popular stories of animals there are several attitudes to be noticed toward this question of intelligence in animals. Some tales, like the "Uncle Remus" stories of Joel Chandler Harris or Kipling's *Jungle Books*, are frankly imaginative, and give to the animals powers and gifts which no one really believes they possess. Others treat them simply as animals with instinct, but without anything which resembles human intelligence; but perhaps the most popular stories of all are those which lie between these two extremes. These do not give their animal heroes the power of speech, or even really human reasoning powers, but they do endow them with many almost human qualities, so that they have distinct characters and arouse the love and sympathy or the dislike of the reader. Of this last-named class of stories, those of Ernest Thompson Seton are probably the best known. See SETON, ERNEST THOMPSON.

Special Senses. When the subject of the senses is approached, the student of animals finds himself on surer ground, for the fact is undisputed that the senses of sight, hearing, touch, taste, and smell exist in the animals, though in widely varying degrees. No one who has heard a horse whinny with joy at the approach of his master, or who has read the

pathetic tale of *Rab and His Friends*, can doubt that animals also experience emotions. But as to these, of course, less definite information exists.

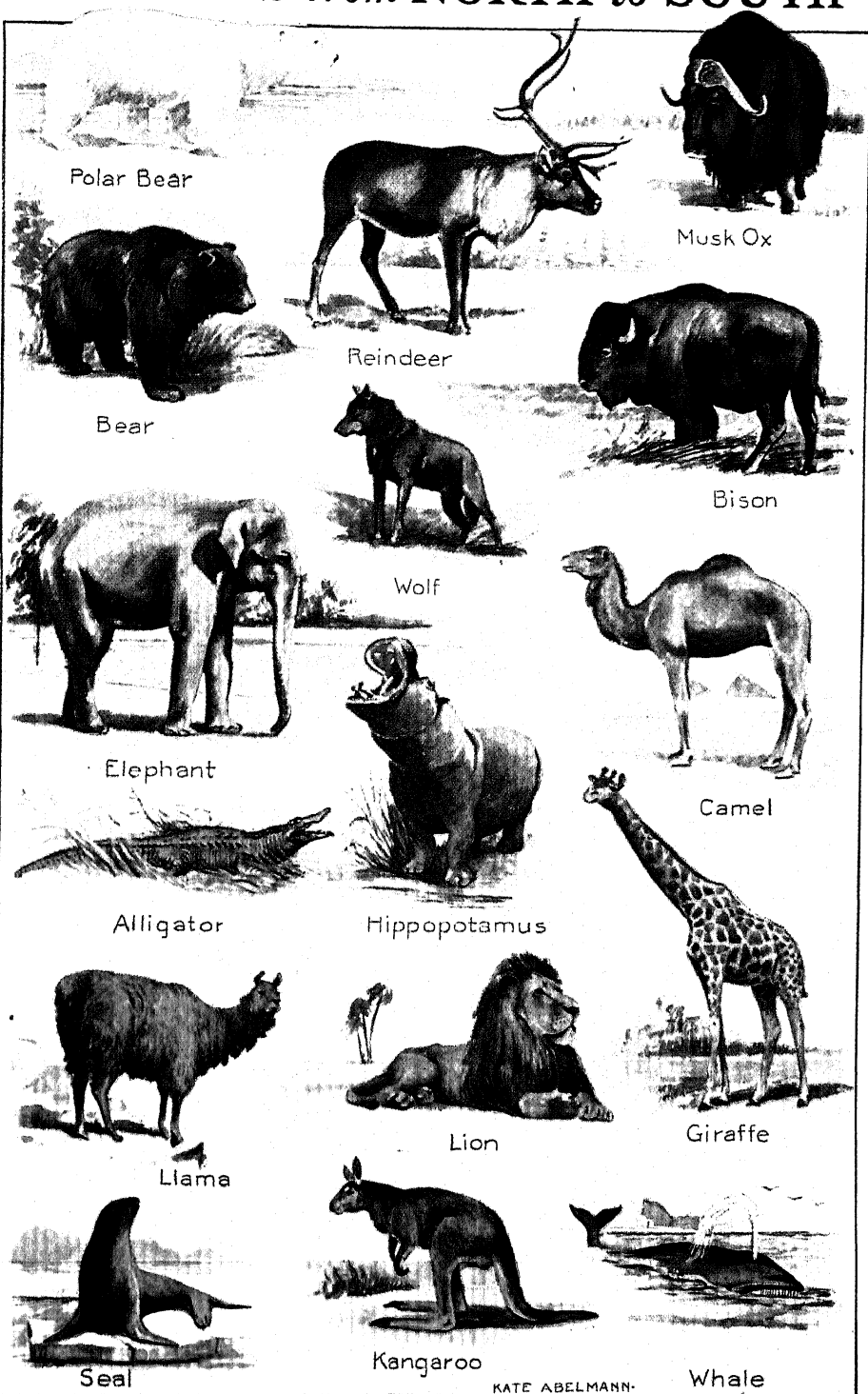
Sight. No general statement can be made about the sense of sight of animals, so wide is the range. There is the sightless mole which burrows its way through the ground, and there is the eagle which, flying high in the air, espies the tiny field mouse on the ground. Some animals, as the bat, the members of the cat family, and the owl, can see far better at night than in the daytime, owing to a peculiar formation of the eye; but most of them resemble men in that they see better in the light. With the lower animals, it is difficult to discern just what part sight plays in their activities. It is certain that many—for example, the earthworm and starfish—cannot see objects as we can, but can distinguish between light and darkness. With others, it may be that often when they seem to perceive things with this sense they are in reality guided by their sense of smell. Certain insects which help in the fertilization of flowers apparently distinguish colors, for they will neglect one flower and fly to one of another color when there is no other difference; but most insects, it is probable, see but poorly.

Hearing. The sense of hearing is no more evenly distributed than that of sight, but in general it may be said that the higher animals have it in far greater perfection than the lower. In fact, all lower forms of life seem to lack this sense. The horse traveling the flinty road hears the hoof-beats of another horse approaching him before the sound reaches his driver's ears; the watchdog pricks up his ears at a noise which is inaudible to every human inmate of the house. It was long believed that fish were entirely deaf, but it seems to be an established fact that some sounds do reach them, though probably not enough to make necessary the "silence" warning to fishermen.

Touch. The sense of touch does for some animals much that the sense of sight does for man. The "feelers" of certain insects, the whiskers of the cat—these are special touch organs developed through long periods of time. A dog's ears seem to be the most sensitive part of its anatomy, while in a bat the wing membrane responds to the slightest touch.

Taste. Here again it is almost impossible to speak with accuracy, for while it is certain that animals delight in one kind of food and reject another, it is probable that smell rather than taste guides them. The two are very closely connected, even in man; and the person who has absolutely lost his sense of smell can distinguish only sweet, sour, bitter, and salt. That there is some sense of taste even in the lower forms of life is proved by the fact that

ANIMALS *from* NORTH to SOUTH



KATE ABELMANN

insects can tell sweet from bitter—a distinction probably not made by the sense of smell.

Smell. Everybody is familiar with the fact that some animals have an almost incredibly keen sense of smell. That of some dogs is so acute as to enable them to recognize people whom they have once seen, and certain varieties of dogs can track a person by scent, even when the trail is crossed by numerous others. A deer, too, when the wind is right, can detect the presence of man before eye or ear makes

it evident. In no other members of the animal kingdom is the sense of smell more pronounced than it apparently is in insects. It is because of this fact that flowers are fragrant, that they may attract to themselves the insect visitors so necessary to their complete life. A new bee in a hive does not need to be guided to the nearest locust-grove; the sweet scent is sufficient guide. On the other hand, birds, reptiles, and many fish depend very little on their sense of smell. W.N.H.

Migration of Animals

This is a term used to denote, first, the irregular overflow of such animals as mice, lemmings, locusts, and chinch bugs from their more usual range, and second, the periodic movements of fishes, birds, seal, and many other animals at the changes of season. As these two classes of movements are different in character, they are discussed separately below.

Irregular Overflows. The movements of the lemming, a ratlike animal found mostly in Norway and Sweden, furnish a good example of this class. At irregular intervals of five to twenty years, great hordes of lemmings leave their homes and travel toward the sea. The explanation seems to be that they multiply so rapidly that the food supply in the vicinity of their homes becomes too small. Then the excess of animals must wander off to other regions; instinctively they move for the preservation of the species.

A similar explanation accounts for the plagues of mice and Rocky Mountain locusts which occasionally ruin thousands of acres of grain on the plains of North America. Flies, chinch bugs, army worms, rabbits, antelopes, and other animals are known to travel far in search of feeding grounds, and these acquired locations become their new homes.

Periodic Migrations. Many animals migrate two or more times a year, the temperature and food supply largely determining the time and extent of such movements. At the approach of spring, the mountain sheep and goats leave the regions in which they have spent the winter and climb upward to the cooler altitudes. Each autumn the caribou travels from his haunts near the Arctic Ocean to the warmer regions around Hudson Bay, and each spring he reverses this course. Years ago, when the buffaloes were still plentiful, their herds wandered north or south with the changing seasons. Whales, especially the sperm whales, have regular courses along the coasts of North America.

Some of the most remarkable migrations are those of fishes, especially the salmon, which ascend and descend rivers, even through rapids and waterfalls. Many other fishes migrate deeper into the oceans or lakes when winter

comes, and return to shallower waters when the sun's rays in the next spring and summer again warm the water. Cod, herring, bass, pike, and whitefish make longer or shorter migrations, according to local conditions.

Most wonderful of all are the migrations of birds, some species traveling even 8,000 miles twice a year. This absorbing story is told in the article **BIRDS** (Migration of Birds). See, also, articles on animals mentioned. W.N.H.

Related Subjects. For an account of the work done by animals in the formation of soil, see **SOIL**. The forms of animal life described in these volumes are too numerous to be listed here, but they are all carefully classified and indexed elsewhere. By consulting the following articles, with the indexes that follow most of them, the student may acquaint himself with a classification, not too technical, of the important animals of the world:

Amphibians	Invertebrates
Animal Worship	Mammals
Arthropoda	Marsupials
Birds	Mollusks
Carnivorous Animals	Porifera
Coelenterata	Primates
Cetaceans	Protozoa
Crustaceans	Reptiles
Disease	Rodents
Echinoderms	Ungulates
Fish	Vertebrates
Insect	Zoology

ANIMAL PRODUCTS

Ambergris	Lard
Bacon	Leather
Beef	Milk
Beeswax	Mohair
Blubber	Morocco
Bristles	Mother-of-Pearl
Buckskin	Musk
Butter	Parchment
Cheese	Pearl
Cowrie	Pork
Gelatin	Shell
Glue	Shellac
Glycerin	Silk
Hartshorn	Spermaceti
Honey	Tallow
Horn	Tripe
Isinglass	Wax
Ivory	Wool

ANIMAL CHARCOAL. See **BONEBLACK**.

ANIMAL HUSBANDRY, IMPROVEMENTS

IN. See **AGRICULTURE**.

ANIMAL INDUSTRY, BUREAU OF. See **AGRICULTURE, UNITED STATES DEPARTMENT OF**.

ANIMAL MAGNETISM. See MESMER, FRIEDRICH ANTON.

ANIMALS, DISEASES OF. See DISEASE, subtitle.

ANIMAL WORSHIP, a part of the religion of many barbarous and partly civilized peoples. It does not grow out of love for animals, but usually out of fear or a belief that the souls of the dead live again in animal bodies. Just as many heathen tribes worship demons because they imagine that by so doing they can induce the demons not to injure them, so they often worship the animals of which they are most afraid, especially mysterious ones that prowl at night.

In India, belief in the transmigration of souls is very common; that is, most of the people imagine that a soul lives many lives, each life in a different body, and that some of these bodies are those of animals. If, therefore, a man hurts a cat or a monkey or even a crawling bug, he may be injuring his grandfather or his mother, and as a consequence, the greatest reverence is shown to animals. The ancient Egyptians held that each god and goddess had certain sacred animals, and to kill one of these was to offend some deity. So strong was this belief that people were in some places put to death for killing a sacred animal. See TRANS-MIGRATION OF THE SOUL; INDIA (Religion).

ANIMIKÉAN, *an i mi ké'an*, **SERIES.** See PROTEROZOIC ERA; GEOLOGY.

ANIMISM, *an'i miz'm*, the belief that all objects, animate and inanimate, possess souls. The name is employed to denote the most primitive and superstitious forms of religion. The animist worships and seeks to conciliate the unknown powers or influences which he is sure exist "in the crumbling hills, in the rushing river, in the spreading tree, which gives its spring to the tiger, its venom to the snake, which generates the fevers of the jungle, and walks abroad in the terrible guise of cholera and small-pox." See ANIMAL WORSHIP; PSYCHOLOGY (Modern Movements).

AN'IMISTS. See INDIA (Religion).

AN'IONS, *an'ionz*. See ION.

ANISE, *an' is*, a plant grown chiefly for its seeds, which because of their warm, spicy taste are much used to flavor pastry, cookies, bread, candy,

liqueurs, and some kinds of cheese. Oil from the seeds has some use in medicine, especially in the treatment of stomach troubles of children. Both oil and seeds are employed in the manufacture of toilet goods, and the leaves provide greens, garnish, and seasoning. The anise plant is native to Egypt and other Mediterranean countries. The section around Erfurt, Germany, is an important center for the growing of anise. The plant thrives only where summers are warm and dry. B.M.D.

Scientific Names. The anise plant belongs to the parsley family, *Apiaceae* (or *Umbelliferae*). Its botanical name is *Pimpinella anisum*.

ANKARA. See ANGORA.

ANNAM, *a nam' or an nahn'*. See FRENCH INDO-CHINA.

ANNAPOLIS, *an ap' o lis*, MD. See MARYLAND (back of map).

ANNAPOLIS CONVENTION. Soon after the Articles of Confederation were adopted by the thirteen American colonies, which had achieved independence, Virginia and Maryland had a dispute about the navigation of Chesapeake Bay and the Potomac River. The difficulty finally led Virginia to ask the other states to send delegates to Annapolis, Md., to discuss changes in the Articles of Confederation, especially to cover defects in those parts referring to commerce and navigation. The delegates met September 11, 1786, but only five states were represented—New York, New Jersey, Pennsylvania, Delaware, and Virginia.

It was evident almost at once that the Articles of Confederation were inadequate, not only in relation to commerce, but in many other respects. The convention, urged by Alexander Hamilton and others, invited all the states to send delegates to a second convention for the purpose of adopting a new Constitution. This second convention met at Philadelphia in May, 1787, and finally adopted the present Constitution.

Related Subjects. The story of this immensely important document is told in the article CONSTITUTION OF THE UNITED STATES. See, also, ARTICLES OF CONFEDERATION.

ANNAPOLIS RIVER. See NOVA SCOTIA (Surface and Drainage).

ANNAPOLIS ROYAL, N. S., an unimportant village of about 1,100 population, situated on the Bay of Fundy, at the mouth of the Annapolis River, 130 miles west of Halifax. It is famous in history as the PORT ROYAL of the Acadians, and is the oldest settlement of Europeans in British North America. It was founded in 1604, four years before Champlain founded Quebec, and sixteen years before the Pilgrims landed at Plymouth. During the most of two centuries it was the scene of many conflicts between the French and English, and several times changed hands. Finally, in 1713, it was ceded to England, and its name was



ANISE
(a) flower; (b) seed.

changed from Port Royal to Annapolis Royal, in honor of Queen Anne. The old fort, now called Fort Anne, has in recent years been given the status of a national park, and the memory of *Sieur de Monts* (see *MONTs*, *SIÉUR DE*), the founder of the settlement, is honored by a monument within the walls.

ANN ARBOR, MICH. See *MICHIGAN* (back of map).

ANNE, an, the name of several royal women of history. Brief biographies of the most famous bearers of the name appear below.

Anne of Austria (1610-1666), daughter of Philip III of Spain, the wife of Louis XIII of France, and mother of Louis XIV. She was regent for her son after the king's death. Her Prime Minister, Cardinal Mazarin (which see), maintained a strong central government. Upon his death, Anne retired to a convent.

Anne of Bohemia (1366-1394), daughter of the German king Charles IV, and wife of Richard II of England.

Anne of Brittany (1476-1514), daughter of Francis II, Duke of Brittany, who, by her marriage with Charles VIII, added Brittany to France. After her husband's death, she married his successor, Louis XII [see *LOUIS* (France)].

Anne of Cleves (1517-1557), fourth wife of Henry VIII of England, who married her for political reasons and divorced her six months later, in 1540. Anne was given a pension and spent the rest of her life in England. She was noted for her homeliness. See *HENRY* (VIII, England).

Anne of Denmark (1574-1619), daughter of King Frederick II of Denmark and Norway, and wife of James VI of Scotland, later James I of England. Her part in the ruling of the kingdom was always unimportant, but she loved the gayety of the court, and her extravagance plunged her heavily in debt.

Anne of Great Britain and Ireland. See following article.

ANNE (1665-1714), queen of Great Britain and Ireland, famous rather for the events of her reign than for what she herself accomplished. While a woman of pleasing character and much good nature, she had no great force or ability. She was the second daughter of James II, then Duke of York, was born at Twickenham, and with her father's permission was brought up in the beliefs of the Church of England. In 1683 she was married to Prince George of Denmark, who never attempted to influence his wife in affairs of state.

She was of the type that must be influenced by someone, however, and Lady Churchill, afterward Duchess of Marlborough, gained such a hold on her as practically to dictate her course. When in 1688 James II was dethroned by William and Mary, Anne was induced by Lady Churchill to support her sister rather than her father, and in 1702 she succeeded William III on the throne. Lady Churchill and others interfered in all government affairs, and the court was the scene of constant struggles for supreme influence.

The chief event of Anne's reign was the union of England and Scotland, whereby Anne became the first to bear the title of ruler of "Great Britain." During much of her reign, also, the Succession Wars were being waged in Europe; one of these wars, called in America Queen Anne's War, resulted from the European War of the Spanish Succession (see *SUCCESSION WARS*). It resulted in France giving up to England practically all of its northern possessions in America. Because of the number of illustrious men who lived and wrote during this period, the reign of Anne is often known as the *Augustan Age* (see *AGE*); such names as those of Pope, Swift, and Addison make it worthy of that name.

ANNEALING, the process of gradually heating and cooling to which many articles of metal and glass are subjected, for the purpose of being made less brittle. When metal is cast, rolled into plates, or drawn into wire, it acquires a certain brittleness which lessens its usefulness. In general, the more rapidly a metal is cooled, the harder and more brittle it is; slow cooling makes a softer but more tenacious metal. Steel tools, especially those used for cutting, are usually immersed in water, which is first heated and then allowed to cool; this produces extreme hardness. Armor plate and cannon barrels, in which strength is essential rather than hardness, are usually annealed in oil, which cools very slowly. Boiler plates and a few other articles are sometimes allowed to cool in the air.

In the manufacture of glass, all the better grades are annealed. The articles, usually arranged on iron trays, are placed in a long furnace, and their temperature is slowly raised almost to the fusing point by their being drawn nearer and nearer the fire. They are then slowly cooled as the trays are drawn away from the fire.

T.B.J.

Related Subjects. The reader is referred in these volumes to the following articles:

Glass
Iron

Steel

Tempering
Wire

ANNELIDS, an' e lidz. See *EARTHWORM*.

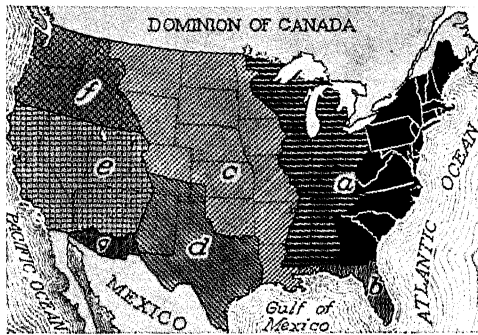
ANNE OF CLEVES. See *HENRY* (VIII, England); *ANNE*, subhead.

ANNEXATION, in international law, the formal process by which a state acquires sovereignty over new territory. Such territory may be unoccupied except by aborigines, in



Photo: Brown Bros.
QUEEN ANNE

which case annexation makes the establishment of civilized government merely the closing act of discovery and conquest. If, however, the territory was a part of another civilized state, annexation implies that the new power acquires



UNITED STATES ANNEXATION MAP

(a) Including solid black and parallel-lined section, original territory after 1783; the solid portion represents the thirteen colonies which fought for independence. (b) Purchased from Spain, 1810. (c) Louisiana Purchase, 1803. (d) Texas annexation, 1845. (e) Mexican cession, 1848. (f) By discovery, exploration, settlement, and treaty of 1859. (g) Gadsden purchase from Mexico, 1853. This map includes only those annexations which affected continental United States.

all rights of ownership and completely displaces the previous sovereignty. Annexation may result from purchase, peaceful cession, or conquest. It may be the acquisition by one state of territory adjoining it, such as the transfer of Alsace-Lorraine to Germany after the Franco-German War and its return to France after the World War, or the acquisition of lands far removed from the boundaries of the nation acquiring these new possessions, as the annexation of Porto Rico and the Philippine Islands to the United States.

When the United States first acquired new territory, the Louisiana Purchase of 1803, there was considerable doubt as to the power of the national government to add to the nation's domain, because no such power was expressly granted by the Constitution. Since then, other additions have been made, and the government's right to annex territory is generally admitted as belonging naturally to a sovereign power.

The following instances of annexation indicate the various methods by which transfers of territory have been made from time to time in different parts of the world:

Alaska: Acquired by Russia as the result of exploration and discovery, Alaska was purchased by the United States in 1867.

Alsace-Lorraine: The possession of this territory by France was confirmed by the Treaty of Ryswick in 1697. In 1871, at the close of the Franco-German War, Germany claimed it by right of conquest, and

in 1919, by the Treaty of Versailles, France regained it as one of the rewards of victory.

Bosnia-Herzegovina: The two provinces comprising this territory were conquered by Turkey in the fifteenth century, placed under the administration of Austria-Hungary in 1878, after Turkey's defeat in the Russo-Turkish War, and were annexed to Austria-Hungary in 1908 by proclamation of the emperor. At the close of the World War the provinces became a part of the new Yugoslavia.

California and New Mexico: These states are a part of the territory acquired in 1848 by the United States by right of conquest, at the close of the Mexican War.

Cameroon: The former German colony of Kamerun, in West Africa, was divided by Great Britain and France in 1916, and the sections were annexed by the respective nations, by right of conquest.

Florida: Purchased by the United States from Spain, in 1810 (ratified in 1821).

Hawaii: Annexed to the United States in 1898 by peaceful cession.

Korea (now called Chosen): This kingdom was annexed to the Chinese Empire in 108 B.C., and after centuries of varying fortunes was forcibly annexed by Japan in 1913.

Madagascar: Forcibly annexed by France in 1896, after subjection of the native tribes.

Schleswig: This Danish province was incorporated with Prussia in 1866, at the close of the Seven Weeks' War. In 1920, following the World War, and after a vote of the people, the northern part was returned to Denmark. This is an example of peaceful cession based on the outcome of a war.

Tripoli: Wrested from Turkey and annexed to Italy in 1911.

Tyrol: South Tyrol, formerly a part of Austria, was annexed by Italy in 1910, after the defeat of Austria-Hungary caused the break-up of the Dual Monarchy.

Related Subjects. The manner in which the parcels of territory named above were annexed by the nations is told in the various articles in these volumes which describe their history. See, also, *UNITED STATES (Growth in Area and Population)*.

ANNIE LAURIE, *laur' rie*, a famous Scottish song, as beautiful and as popular now as when written, in the seventeenth century. William Douglas, a soldier of fortune, wrote it of a real Annie Laurie, daughter of Sir Robert Laurie of Maxwellton, with whom he was in love, but its charming lines evidently did not win her affection, for she married another man.

Lady John Scott Spottiswood, an English music writer, loving the old words and feeling that they deserved music as beautiful, wrote in 1836 the tune to which they have ever since been sung, and which has become so much a part of them that the two can scarcely be thought of separately. The first stanza runs as follows:

Maxwelton's braes are bonnie
When early fa's the dew
And it's there that Annie Laurie
Gie'd me her promise true—
Gie'd me her promise true,
Which ne'er forgot will be;
And for bonnie Annie Laurie
I'd lay me doune and dee.

ANNISTON, ALA. See ALABAMA (back of map).

ANNIVERSARIES, an i vur' sah riz, FOR CELEBRATION. There are certain days of the year that have a special meaning because they are the anniversaries of events that have influenced the history of the world. Such dates are the birthdays of the world's great men and the anniversaries of decisive battles or of deeds that have made history. In the articles in these volumes descriptive of the months of the year will be found dates of hundreds of anniversaries, selected with a view to their fitness for celebration. To these the reader is directed.

Wedding Anniversaries. The custom of giving certain kinds of presents on each wedding anniversary has been common to all civilized countries. It is now usually disregarded, except for the silver, golden, and diamond anniversaries. Other anniversaries of different periods which are occasionally celebrated are listed below:

- First—Paper or cotton.
- Second—Straw or paper.
- Third—Candy or leather.
- Fifth—Wooden.
- Seventh—Floral or woollen.
- Tenth—Tin.
- Twelfth—Silk and fine linen.
- Fifteenth—Crystal.
- Twentieth—China.
- Twenty-fifth—Silver.
- Thirtieth—Pearl.
- Fortieth—Emerald or ruby.
- Fiftieth—Golden.
- Sixtieth, Seventieth, or Seventy-fifth—Diamond.

ANNUALS, an' yu alz, plants which spring from the seed, then blossom, produce fruit and die, all within one year. They are distinguished from *biennials*, which take two years, or two growing seasons, to complete their life's course, and from *perennials*, which live more than two seasons, and sometimes, as in the case of certain trees, to an age that may encompass many centuries. Perennials may fruit once, or for many years.

Annuals afford some of the most useful as well as the most ornamental of plants. Thus the pea, the bean, the tomato, the nasturtium, and the sweet pea are all annuals, and must be raised from seed each year. In climates which have a cold winter there is danger of confusing those biennials or perennials which die down to the ground at the close of the growing season, with annuals. Thus, the carrot is a biennial, though during the winter the leaves may die just as completely as do tomato plants. B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles:

Biennials	Botany	Perennials	Weeds
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ANNU'ITY, from the Latin *annus*, meaning year, is the term applied to a sum of money paid annually, but it should not be confused with *interest*. A person usually is said to buy

an annuity; that is, he pays a certain sum as consideration, in return for which some other person or company agrees to pay him or his heirs an annuity. The lump sum necessary to secure a certain annual return is determined by rules and principles which have been the subjects of careful investigation. If the annuity is to be perpetual, the present value will evidently depend upon the rate of interest on money; if the annuity is to be for life, the present value, obviously, is dependent upon not only the rate of interest, but the probable number of years the beneficiary will live, which in turn depends upon age, sex, climate, and other influences.

In some European countries the granting of annuities is conducted by the government; in the United States the purchase of annuities is not nearly so common a practice as in Europe. Its place is taken largely by life insurance, which, obviously, is exactly opposite in character, the difference being that small annual payments are made, with the agreement that at a certain time a lump sum will be paid to a designated beneficiary. See INSURANCE; INTEREST. J.W.Y.

[Under the title MORTALITY, LAW OF, a table of probable length of life is given.]

ANNULATA, an u la' tah. See ZOÖLOGY (Divisions of the Animal World).

ANNUNCIATION, a nun si a' shun, THE, the title of several famous paintings which picture the angel Gabriel announcing to the Virgin Mary that she has been chosen to be the Mother of Christ. The story, a favorite with religious painters, is told in *Luke* i, 26-38. The Virgin is usually shown with a book or needlework; the angel bears a lily or an olive branch, for thus the early legends represented these characters. Many master artists have been attracted by the subject of the Annunciation, and their treatment of the story is reverent and exalted; the paintings have always the spirit of peace, harmony, and mystery. Well-known paintings bearing this title are those by Andrea del Sarto (Pitti Gallery, Florence); Fra Angelico (Church of San Marco, Florence); Titian (Venice); and Dante Gabriel Rossetti (National Gallery, London). In the latter, the Virgin is a portrait of the artist's sister, Christina Rossetti.

Related Subjects. The reader is referred in these volumes to the great artists who have excelled in religious paintings of the above character. See, also, PAINTING.

ANNUNZIO, PRINCE GABRIELE D', dahn noon' dze o (1864-), an Italian poet, novelist, and dramatist, the foremost writer in Italy at the beginning of the twentieth century. Though he was born and educated in Italy, his first literary works were French in spirit. They were psychological studies, pessimistic, and occasionally frank beyond the point of propriety. Early in his career he was stirred by

the beauty of the actress Eleanora Duse, for whom he wrote *La Gioconda* and other plays. His affair with her ended in 1900, when he published *The Flame of Life*, an ungrateful revelation of Duse's life and personality, which sent her into retirement for years. Some critics, in defending her, declare that she "lifted D'Annunzio from mediocrity to an elevation his own merit could not maintain," though this is declared too severe a judgment.

In 1915 his written and spoken appeals to his countrymen were the chief factors in rousing their feelings against Austria and Germany, thus plunging Italy into the World War. This intense nationalism was in striking contrast to d'Annunzio's early philosophy of life. After the Peace Conference (1919) denied Fiume to Italy, he occupied the city for a time with troops as a protest against the decision of the powers. In 1924 he was created a prince.

His Works. Among his most important novels are



Photo: Brown Bros.

D'ANNUNZIO

The Child of Pleasure, The Intruder, The Triumph of Death, and Virgins of the Rocks. His plays lack action, and have not been very successful on the stage; the best of them are *Francesca da Rimini, The Daughter of Jorio, The Martyrdom of Saint Sebastian*, a mystery play, and *The Dead City*, written for Sarah Bernhardt. His later writings include *Le Chevre-feuill, Per la più Grande Italia, La Leda senza Cigno, La Befia di Buccari, La Riscossa, and Notturmo.*

Related Subjects. The reader is referred in these volumes to DUSE, ELEONORA; FIUME.

ANODE, an' ohd. See ELECTRODE; ELECTROLYSIS.

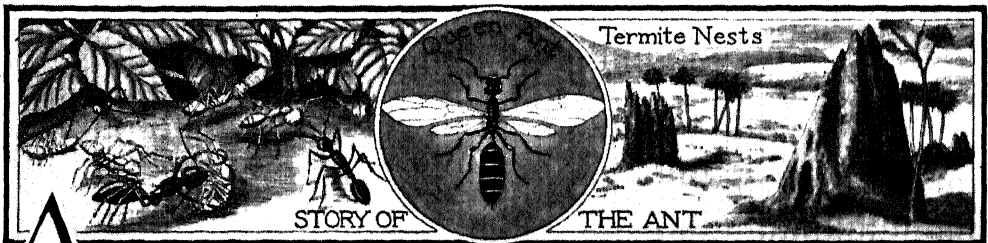
ANODYNES, an' o dynz, medicines that deaden pain by their effect on the nervous system. They may act by inducing sleep or by producing insensibility, or both. The term *analgesic* is applied to any drug, such as aspirin, that deadens pain without causing the patient to lose consciousness. Examples of anodynes are opium and its numerous derivatives; bromides, chloroform, ether, and veronal. They should not be taken without medical advice, because of their powerful effects.

Related Subjects. The reader is referred in these volumes to the following articles:

Anesthetic	Narcotic
Aspirin	Medicine and Drugs

ANOPHELES, a nof' e leez, the mosquito that carries malaria. See MOSQUITO; MALARIA.

ANSONIA, CONN. See CONNECTICUT (back of map).



ANT. "Go to the ant, thou slug-gard," wrote Solomon, thousands of years ago; "consider her ways and be wise; which having no guide, overseer, or ruler, provideth her meat in the summer and gathereth her food in the harvest." And Shakespeare put into the mouth of his delightful fool in *King Lear* the words, "We'll set thee to school to an ant, to teach thee there's no labouring i' the winter."

There is a significance about these references, made many centuries apart, both before the days of systematic nature study. They show that the ant has always attracted attention; not by reason of beauty, like the birds and butterflies, nor because, like the bee, it furnishes man with a delicious food; but because its activities suggest in so many ways those of human beings. In general, it is the higher animals in which man is most interested—those

which are structurally not unlike himself; but the ant is an exception to this rule, because it shares with man one dominant trait—it is a strongly social being.

Rank in Insect World. Like wasps and bees, with which they have many characteristics in common, the ants belong to the great order of membrane-wings, or *Hymenoptera*, and by some students of insect life they are classed at the very top. This does not mean that they are more intelligent or more capable than all other insects. The social bees, for instance, display fully as much ingenuity and build far more elaborate homes for themselves; but next to man, ants are the most adaptable form of animal life in the world. Like man, they have found their way everywhere. No region is too hot or too cold, too dry or too moist to meet their demands. Originally flesh-eaters, many

species have so far adapted themselves to conditions that they can live and thrive on plant food; and just because of this adaptability they can maintain large colonies. For in all ranks of animal life the flesh-eaters are inclined to be solitary, partly because their preying instinct makes them savage, but chiefly because animal food is nowhere certain enough and plentiful enough to furnish unlimited supplies.

Nor is this the only way in which the ants show their adaptability. They can endure astonishingly wide temperature changes without apparent suffering, merely digging themselves deeper into the ground when extremes of heat or cold are to be guarded against. Neither drought nor flood, unless too long continued, can destroy their communities, and even food scarcity can be endured for a time. The female, indeed, can store up within her body enough food so that she does not need to eat for the greater part of a year. No wonder then, that ants are the "dominant" insects, and that, as some authorities hold, reptiles have developed scales, caterpillars hair, and animals fur, partially as defenses against the everywhere-present little creatures.

Ants establish more lasting communities, too, than do any other of the lower animal forms. A beehive may keep its tenants indefinitely, but they are not the same tenants, for bees are short-lived, the queen living but three years, or thereabouts, and the workers but a few weeks. The worker ants, on the other hand, live from four to seven years, and it is not unusual for a queen to attain the age of fifteen years.

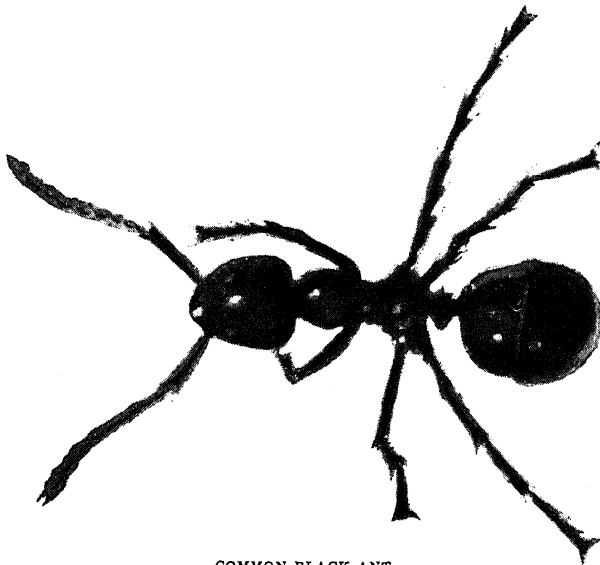
The Three Classes. In studying ants, one is constantly reminded of the closely related bees, and one of the fundamental resemblances consists in the number of life-forms. For among the ants, as among the bees, there are not only males and females, but workers, or neuters, as well. These last are but undeveloped females, for the most part sterile, but

occasionally able to perform the important function of laying eggs. The workers are by far the most numerous class, though each ant-

community has a number of females, and not just one queen, as do the bees. The females are practically always winged, and usually the males, but the workers, which are the smallest members of the colony, are wingless. There is no romance for them; no flight into the air. They are born to work, and they remain faithful to their tasks until they die and are carried out of the nest. The males, on the other hand, do no work, and their life-period is short, for the ants

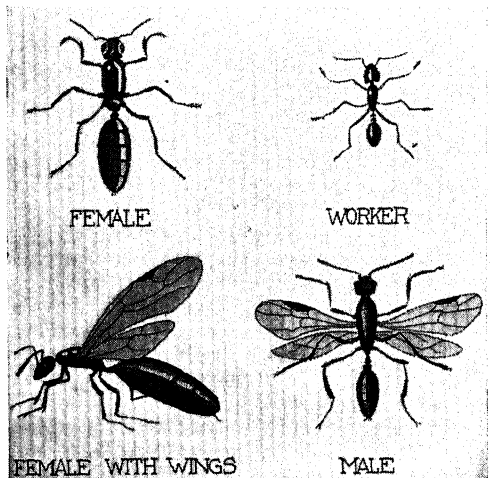
are too careful economists to support for a long time any parasitic members.

Parts of an Ant. Since it is impossible to go anywhere without finding ants of some species or other, everybody can recognize them at



COMMON BLACK ANT

This picture was reproduced from a photograph, and is highly magnified. The ant was three-eighths of an inch in length, exclusive of antennae and legs.

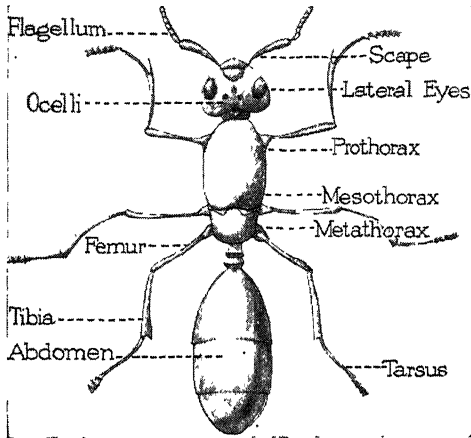


THE THREE CLASSES OF ANTS

sight. The most noticeable distinguishing mark is the sharp differentiation between head, thorax, and abdomen—in some species so pronounced that it seems strange that the ants

do not actually break in two. The brain of the ant, scientists tell us, is larger in proportion to the size of its body than that of any other living creature.

The outer covering of ants is tough and horny; in some species it is shiny, in others dull



PARTS OF AN ANT

and rigid. One of their chief cares is to keep this horny covering spotlessly clean, and they spend much time in the nest in polishing each other with antennae and with tongue. In the accompanying diagram the various parts are clearly shown. First, there are the eyes—very curious and interesting organs. If examined under a microscope, each of these “lateral eyes,” as the diagram calls them, is seen to be made up of a group of little lenses, or facets, fitted into each other like a honeycomb. Now, ants cannot turn their eyes about to the right or left, but each lens enables them to see in a slightly different direction, so that altogether they gain a fairly good, all-round view. These compound eyes are not the only ones possessed by ants, for many of them have three *ocelli*, or little eyes, on the top of the head. But with all this provision, ants do not really see well. Why should they, when most of their time is spent underground, in darkness?

If eyes, however, are of no use to an ant in its home environment, the same cannot be said of the other sense organs, the *antennae*, or *feelers* (see ANTENNAE). These exceedingly delicate “horns” are fitted into little sockets at the front of the head, and are moved to and fro with great rapidity when the ant is exploring or finding its way in the dark. The antennae are not organs of feeling merely; in some way not understood they are organs of smell as well, and many a time when an ant seems to be guided by its eyesight, it is really dependent on its sense of smell. In the diagram, the word *antenna* does not appear, but the two parts of it are named; the jointed part,

which looks like a string of little beads, is called the *flagellum*, and the *scape* is the unjointed part.

The other names in the diagram may at first look forbidding, but a very little study will make them clear. *Femur*, *tibia*, *tarsus*—those terms are familiar to anyone who has the slightest acquaintance with anatomy, for in human beings they are the names given to the thigh-bone, the lower bone of the leg, and the instep, with its many small bones; a glance at the illustration will show that they are used for corresponding parts of the ant’s anatomy. The three names which relate to the thorax are very simple when it is understood that *pro* means *fore*, or *front*, *meso* means *middle*, and *meta* means *hind*, or *after*.

The *mandibles*, or jaws, are not shown in the illustration, but they are by no means unimportant in the ant’s scheme of things. Numerous indeed are the parts these mandibles are called on to play; they serve as hands, for the carrying of prey or other burdens; as spades, as saws, as swords, as knives and forks—as any sort of implement or weapon, in fact, of which the ant has need.

How Ants Live. All this, while interesting enough, is only preliminary to the really fascinating question of the home life of ants. To be sure, all ants have not the same nesting habits, any more than all birds; but of the 5,000 or more species that have been described, all are social—that is, they live in colonies. Most numerous of the ants in temperate regions are those that make their nests in the ground, and their mode of life will be described here in some detail.

The Nuptial Flight. Let us suppose that we are watching an old, well-established community on a bright summer day. Some of the workers are busy about their regular tasks, but many of them are running excitedly to and fro, darting into the hole and then out, with no apparent purpose. Suddenly something happens. Out of the hole with a rush come the gauzy-winged males and females, called forth not only by the warmth of the sun but by some mysterious instinct which tells them that mating time has come. Up and up they fly, until they are lost to sight, and only the strongest males are able to overtake the fleeing queens. High in the air the mating takes place; and then the joyous hour of flight and romance is over, and both return to humdrum, earthy life. The male dies almost immediately, and the female, realizing that never again will she need her delicate wings, tears them off or rubs them off.

The New Colony. Some of the queens are captured by the workers and borne back to the communities from which they came, but others found new colonies. The wingless queen, who has never done any real work in her life,

now digs for herself a little burrow in the soil, perhaps wearing away her mandibles and maiming herself for life. Having hollowed out a small chamber at the lower end of the burrow, she closes the opening completely, and remains underground, without food, for month after month. The first eggs she lays become in time tiny legless grubs, or *larvae*, which are perfectly helpless and must be cared for by the queen. She feeds them with secretions from her own body, until very slowly they pass to the next stage, becoming cocoons, or *pupae*. These in time become worker ants, perfectly formed but very small—*minims*, they are called; and the queen's days of caring for her offspring are then over, for the little workers relieve her from all her tasks, save that of egg-laying.

The Nest. They dig a real nest, with branching galleries leading to chambers of various sizes, and there then appear the opening at the surface of the soil and the familiar crater-shaped ant-hill, formed of the tiny pellets of soil which are brought to the surface. In some of the chambers food is stored; in others are placed the eggs and the larvae and pupae as they develop. There is a regular scheme of distribution of these, depending apparently on temperature and moisture. The duties of the workers are not finished when they have placed their charges, for the queen and the larvae must be fed, and the young in all stages must be kept strictly clean. Many workers spend most of their time polishing the eggs and the larvae with their tongues, while others take the part of nurse-maids and carry the young about. In the evening, after a hot day, long trains of workers can often be seen, bearing in their mandibles the little white bodies which are usually mistaken for eggs, but which are in reality larvae and pupae. Sometimes these are deposited on the ground and allowed to remain there, but often they are borne to and fro by their careful nurses, like children out for an airing.

Just here a word of caution is necessary. There is always the danger in studying about any form of animal life that actions may be over-interpreted; that the enthusiastic observer may argue that because men when they act in certain ways are moved by certain feelings, like actions in animals are to be accounted for by similar impulses. To be sure, the ants show what appears to be the tenderest affection for their charges, but their movements are governed by unreasoning instinct and not by conscious solicitude. Many an observer has been so misled, and has written tales of the joy of ants on meeting after a long separation or of their grief over their dead, and of the elaborate funeral ceremonies—tales which seem too good to be untrue, but which nevertheless must be cast into the realm of fable. Ants have been known to die when separated from their own

kind, and some scientists have ascribed their dying to loneliness. The true explanation seems to be that the social ants cannot exist if



NEST OF THE COMMON ANT

denied opportunity to satisfy their instincts of home-building and reproduction.

Ant Food. As stated above, the earliest ants ate only flesh food, and there are many species which still hold to this original preference. Young naturalists have a clever way of taking advantage of this fact when they have some small animal, as a mouse or a bird, which they wish reduced to skeleton form. If a populous ant nest be chosen, and the little animal be left close enough so that it cannot be overlooked, it does not take long for the perfectly clean skeleton to appear. Ants will also empty birds' eggs if the shells are not too tough.

But a great many species of ants have progressed beyond this hunting stage, where the whole business of life is foraging for prey, and are living in what might be called a pastoral, or agricultural, state. Some of them keep herds of "ant cows" and "milk" them in most approved fashion—"cows" which are nothing more than plant lice, known as *aphides*, that secrete a sweet juice (see *APHIDES*). The lice are "pastured" on some plant, and the ants stand guard over them, going about from one

OUTLINE AND QUESTIONS ON THE ANT

Outline

I. Parts of the Ant

- (1) Head
 - (a) Lateral eyes
 - (b) Ocelli
 - (c) Antennae
 - (d) Mandibles
- (2) Thorax
- (3) Abdomen
- (4) Legs
- (5) Wings of males and females

II. Classes of Individuals

- (1) Male
 - (a) Usually winged
 - (b) Does no work
 - (c) Short-lived
- (2) Females
 - (a) Largest form
 - (b) Winged
 - (c) Lays all eggs
- (3) Worker, or neuter
 - (a) Undeveloped female
 - (b) Smallest form
 - (c) Most numerous
 - (d) Does all work
 - (e) Wingless

III. Rank Among Insects

- (1) Intelligence
- (2) Adaptability
 - (a) To climatic conditions
 - (b) To food supply
- (3) Length of life

IV. Mode of Life

- (1) All species social
- (2) Plant-dwellers
 - (a) Nests in dead trees
 - (b) Nests in living plants

- (3) Soil-dwellers
 - (a) Manner of nest
 - 1. Galleries
 - 2. Chambers
 - (b) Mating
 - (c) Founding new colony
 - 1. Queen's part
 - 2. Workers' part
 - (d) Regular tasks
 - 1. Keeping nest clean
 - 2. Securing food
 - 3. Feeding young
 - 4. "Nurse-maids"

V. Development of Young

- (1) Egg
- (2) Larva
- (3) Pupa
- (4) Young ant

VI. Choice of Food

- (1) Flesh-eaters
- (2) "Pastoral" ants
 - (a) Plant lice kept as "cows"
- (3) Seed-eaters
- (4) Fungus-eaters

VII. Relation to Man

- (1) Effect on soil
- (2) Help in decomposition of animal matter
- (3) Wood-gnawing
- (4) Harm to plants from pastured lice
- (5) Enemies of vermin

VIII. How to Study Ants

- (1) Making a formicary
- (2) Necessity for darkness
- (3) Furnishing food
- (4) Furnishing "cemeteries"
- (5) Use of magnifying glass

Questions

What reason is there for considering the ant as the highest type among the insects? Are there solitary ants, as there are solitary bees?

What is a *formicarium*?

The first three stages in the life of the race are generally spoken of as the hunting, pastoral, and agricultural stages. Is there anything in the ant world to correspond to these?

In what ways does the ant resemble man in its mode of life?

Why are ant communities more lasting than those of any other insect?

Is there perfect social equality among ants, or is there always an inferior class?

How many kinds of individuals are to be found in each ant colony?

OUTLINE AND QUESTIONS ON THE ANT—Continued

Questions

- Which is the longest-lived? The shortest-lived?
Has an ant more or fewer eyes than a man?
What did all ants originally eat?
Why has their broadening taste made possible larger communities?
Does the female ever do any work? The male?
What are the little white burdens which the workers sometimes bring to the surface of the soil?
What function do the *antennae* fulfil?
What are the three divisions of the thorax called?
What connection have ants, according to some authorities, with the fact that reptiles have scales?
To what other insects is the ant closely related?
What is the meaning of the name of the order to which they belong?
Are ants widely spread over the earth or restricted to a few places?
Give several proofs that the ants are thoroughly sanitary in their home life.
What is the most noticeable difference between the workers and the two other classes of ants?
Why is it wise to use a red light when examining ants in a temporary nest?
Why does the eye of an ant have more than one lens, or facet?
What are the two parts of the antenna called?
What three names, used in human anatomy, are applied to the three parts of the leg of an ant?
Which are an ant's most delicate sense organs?
About how many species of ants have been described?
Why does the female tear off her wings?
How is the queen supplied with food after she has shut herself up in her burrow to begin a new colony?
What are the first little workers that hatch out called?
To which class of ants does the institution of slave-holding really do harm?
Into what error have sympathetic observers of ants frequently fallen? Is it a natural error?
Do ants ever die of loneliness?
Are the young in their various stages of development kept jumbled together in the nest?
To what characteristic of the ant do most literary allusions have reference? Give two quotations.
Is an ant's skeleton on the inside or the outside?
What is the origin of the "gardens" which sometimes grow about ants' nests?
Which ants are called the "Huns and Tartars of the insect world"?
Do the slave-holders capture full-grown ants and force them into servitude?
What effect does the nest-digging have on the soil?
Is the farmer who grows corn glad to have colonies of black ants in his fields?
Why are the ants that live on fungi commonly known as *parasol* ants?
What is a neuter?
Where is the ant's sense of smell located?
In what way can the amateur naturalist profit by the presence near his home of an ant-community?
What functions have the mandibles?
What places do some tropical ants select for their colonies?
What kind of food should be placed in a formicarium?
What is there that is peculiar about a termites' nest?

to another and stroking them with their antennae until they yield a clear drop of fluid, which is eagerly swallowed.

Others collect seed, or even grain, and store it in their nests, where it is kept scrupulously clean. Certain observers, noticing about the

capacious trunk of a tulip tree affords them a comfortable home.

Studying Ants. Many forms of animal life which it is interesting to read about cannot be studied at close range, but this is not true of ants. With very little trouble anyone may observe for himself the habits of these little creatures. The materials needed are simple—an ordinary tumbler, a saucer or plate, and, if possible, a small magnifying glass which may be purchased cheaply.

Into the tumbler put part of an ants' nest, such as may be found in any open, sandy stretch. The tumbler should be about half full, and as many of the ant colony as possible should be included. Then place the tumbler in the plate or saucer and pour water around it, or your ant visitors may have escaped by the next morning. This nest with which you have provided the ants—indeed, any ants' nest—is called a *formicarium*, or *formicary*, from the Latin word *formica*, meaning *ant*. It still differs in one important particular from a true ants' nest, for that, being underground, is in total darkness; and total darkness is very grateful to ants. Wrap a dark cloth, therefore, around your tumbler, and remove it only when you wish to make your observations. There is one curious fact about ants' sensitiveness to light—it disappears in the case of red light, to which they seem almost totally blind. If, therefore, you can take your formicary for study into a room with a red light, you will disturb the little inhabitants far less than if you subject them to untempered sunlight.

Probably, in taking up the material for your formicary, you have included no food, so it will be necessary for you to "board" your visitors as well as house them. Bread crumbs, broken rice, a little honey or sugar, or a crumbled nut meat or two will prove quite satisfactory to them. Something else, also, you may provide them with—something which the old-time observer with his over-interpretation of facts called cemeteries. An ant community is kept strictly sanitary, and no refuse of any sort is allowed to accumulate in the chambers or galleries. Thus, the bodies of dead ants are carried out immediately, and if you will place on the nest a paper box about an inch square and a quarter of an inch in height, you will find that it will probably be made use of as a repository for the dead.

Watching closely, you may see the worker ants reconstructing the nest which has been disturbed in process of transference to the glass. Winding avenues and spreading chambers will appear, and you may know that the part of the soil which you cannot see is tunneled in the same manner. You may occasionally see, too, the larvae and pupae brought up to the air and warmth; and if you have been fortunate enough to take up with the nest all three kinds



A FORMICARIUM

A simple suggestion for a temporary home for ants while they are being studied.

nest of seed-eating ants circles of growing plants, have declared that the ants actually planted seed and lay in wait for the harvest, but more careful study reveals the fact that the plants have sprung up from seed accounted useless by the ants and cast out of the nest. Then there are the interesting fungus-eating ants, which go about securing their novel food supply in systematic manner. Each foraging worker returns to the nest bearing a leaf, which is carried by the stem, with the blade extending over the ant's back. So suggestive is the appearance that these ants are commonly known as *umbrella*, or *parasol*, ants, but it is not as a protection that the leaves are wanted. Once in the nest, the leaves are cut by the jaws of the ants into tiny pieces, and on the molding heap so formed grow fungi, the favorite food of these ants. The heap is kept very clean, so that no bacteria ever grow upon it.

Certain ants, particularly in the tropics, depend on plants not only for food, but for dwelling places, as well. The rotting stump of a tree, the hollow stem of a weed, or the

of ants, you may discover with your magnifying glass the winged males and females. No matter how long and how carefully you watch, however, you will never see an ant with wings doing any sort of work.

Beneficial or Harmful?

Nobody doubts that earthworms really do good by stirring up the surface soil, but seldom are the ants given credit for any such helpfulness. They are, however, valuable in much the same way, and they are useful also in hastening the decomposition of organic matter. One large colony, it was estimated, brought into the nest daily about 100,000 dead insects. But not all ants do more good than harm. Many a garden spot has been rendered unattractive by their nests; many a house has suffered real damage from their gnawing. Perhaps the most troublesome habit of the ants, however, is that of pasturing plant-sucking insects. The common black ant is very fond of the fluid secreted by the corn-root louse, and does not trust to chance to find it. Collecting all the eggs it can, it bears them to its nest, and there cares for them during the winter and until the young hatch out in the spring. These young lice it carefully places on the roots of the corn, where they may do great harm to the farmer's prospects.

Further Interesting Facts. One of the most curious things to be observed in connection with some species of ants is their habit of keeping slaves. From some nest not far from their own they capture eggs, larvae, and pupae, which they care for until these have developed into full-grown ants. Then the "nurses" cease their labors, and the "foreign" ants are compelled to do all the work. But it is the slaveholders and not the slaves who suffer from this custom, for the lazy captors lose in time all capacity for work and become degenerate.

Much has been told about the wonderful customs of the driver ants—those "Huns and Tartars of the insect world" which do not hesitate to prey on animals thousands of times larger than they are. Sometimes, in the tropical or subtropical regions in which they live, they invade a house, and promptly all vermin take leave. Bugs, mice, even the largest and fiercest rats, dare not enter into contest with them, and thus far the householder is the gainer. But the cure speedily proves worse than the

disease, for the ants infest everything. Beds may be placed with their legs in pans of water, but even then the little pests drop down from the ceiling.

W.J.S.

Classification. There are at least 5,000 known species of ants, all of which are placed in the super-family *Formicidae*. The common red ant, a species that often infests houses, is *Monomorium pharaonis*. A well-known slave-making ant is *Formica sanguinea*. The so-called *white ants* of the tropics are properly called *termites* (which see).

ANTANANARIVO, *antan an ar e' vo*, former spelling of Tananarivo, capital of Madagascar (which see).

ANTARCTIC, *ant ark' tik*, **CIRCLE**, an imaginary circle parallel to the equator, $23\frac{1}{2}^{\circ}$ north of the South Pole. The name is derived from the Greek words meaning *opposite the bear*, in allusion to the Great Bear, the most conspicuous constellation within the Arctic regions (see **BEAR, GREAT**). Polar con-

ditions of climate exist considerably north of the Antarctic Circle, though it is usually considered the northern limit of the Antarctic Ocean. When the sun reaches the Tropic of Capricorn on its southward journey, the regions south of the Antarctic Circle have no night. When on the Tropic of Cancer, the limit of its northern progress, darkness prevails in that desolate area, and the South Pole has six months day and six months night in the year. The Antarctic Circle is represented in the map on the next page by the dotted line. See **ZONE. R.H.W.**

ANTARCTIC LANDS AND SEAS,

a name for the part of the earth which surrounds the South Pole. Strictly considered, this region is bounded by the Antarctic Circle, but in a wider sense it includes the entire area in which Antarctic influences are felt. This area extends to latitude 60° , and in some sections to latitude 50° . Great ice floes drift northward as far as Cape Horn and be-



INVESTIGATING SOME FOOD

An ant "feeling" of a piece of corned beef with his antennae. His home is in a crevice of a concrete sidewalk; the opening is seen in the picture.



Photo: Visual Education Service

IN PANAMA

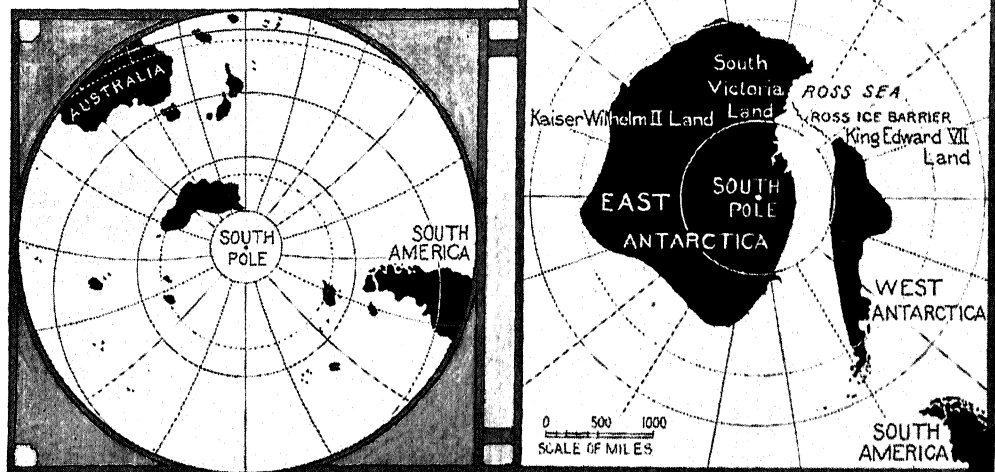
An ants' nest, high above the ground.

yond, and single icebergs float even farther.

The Lands. The remoteness of the Antarctic region from Europe, the home of the early explorers, for centuries prevented its exploration, and it is only in the twentieth century that rumor and imagination have yielded to knowledge. It is now known that there is a vast Antarctic continent, but its area is as yet the merest surmise. It may be as large as Australia; it may be slightly larger. A large part of it is a high, ice-covered plateau, at an elevation ranging from 7,000 to 10,000 feet. The South Pole itself lies at an altitude of 10,200 feet above the level of the seas. Amundsen ascertained this fact, and Byrd confirmed it.

Most of the Antarctic continent, so far as it has been explored, has high coasts, covered

colder in summer than those in the north polar region. The coldest temperature seems to be about -70° , and the summer temperature occasionally rises to -20° . Sudden blizzards, with terrific winds and blinding snow, are frequent at all seasons. Such a blizzard caused the death of Captain Robert Scott and his



ANTARCTIC LANDS AND SEAS

To the left is the map of the region as it was known before the adventurous explorations of Amundsen and Scott. The map at the right pictures the known lands when Commander Byrd sailed to the region late in 1928.

with snow and ice, which sometimes extend to the water's edge. In many regions, the actual shore line is hidden by masses of ice which rise perpendicularly from the water. The largest of these is the Great Ice Barrier, also known as the Ross Barrier, from the name of its discoverer. The Ross Barrier extends from Ross Island to King Edward VII Land, a distance of 400 miles. This wall of ice, from 200 to 300 feet high, was discovered in 1842, but for years no explorer found a way to cross it. Back of the ice barrier the land rises to a plateau 4,000 feet above the sea. In the interior, especially in South Victoria Land, are high mountain ranges, at least one of which, Mount Erebus, is an active volcano. Recent explorations point to the possibility that these mountains are a part of a great range or series of ranges which extend to West Antarctica.

Climate. The temperatures in the south polar region seem to be warmer in winter and

three companions after they had succeeded in reaching the Pole. The winds in the interior of the Antarctic continent are mainly southeast, but farther from the Pole the prevailing winds are from the west or northwest. Near the Pole itself the snowfall is comparatively light, the annual precipitation being less than ten inches. The heaviest precipitation, about twenty-five inches, seems to be near the coasts of the Antarctic lands.

Plant and Animal Life. Vegetation is extremely scanty, but there are a number of species of grasses, mosses, and lichens. The coal deposits which have been discovered at several points indicate, however, that the South Pole was in a past geologic age in a warm region with abundant vegetation. Among animals there is a great variety of birds, including penguins, petrels, and fulmars, but there are no land mammals. The sea teems with an astonishing number of seals, sea lions, whales, dolphins, sponges, mollusks, echinoderms, and

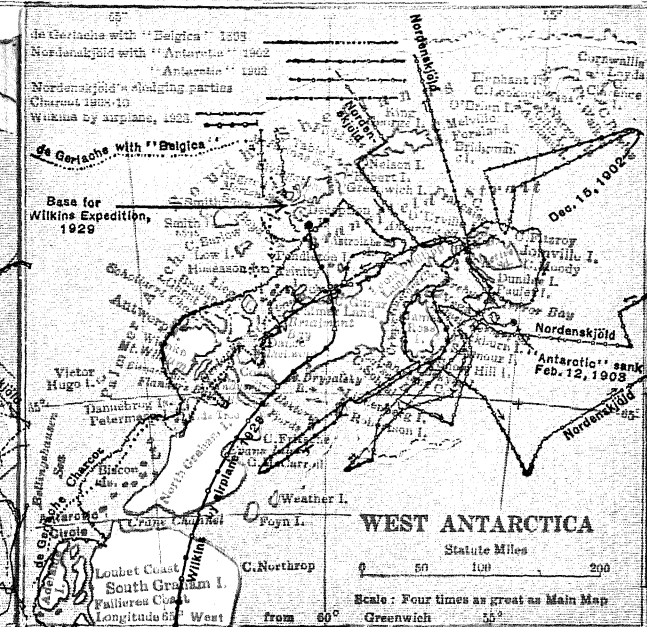
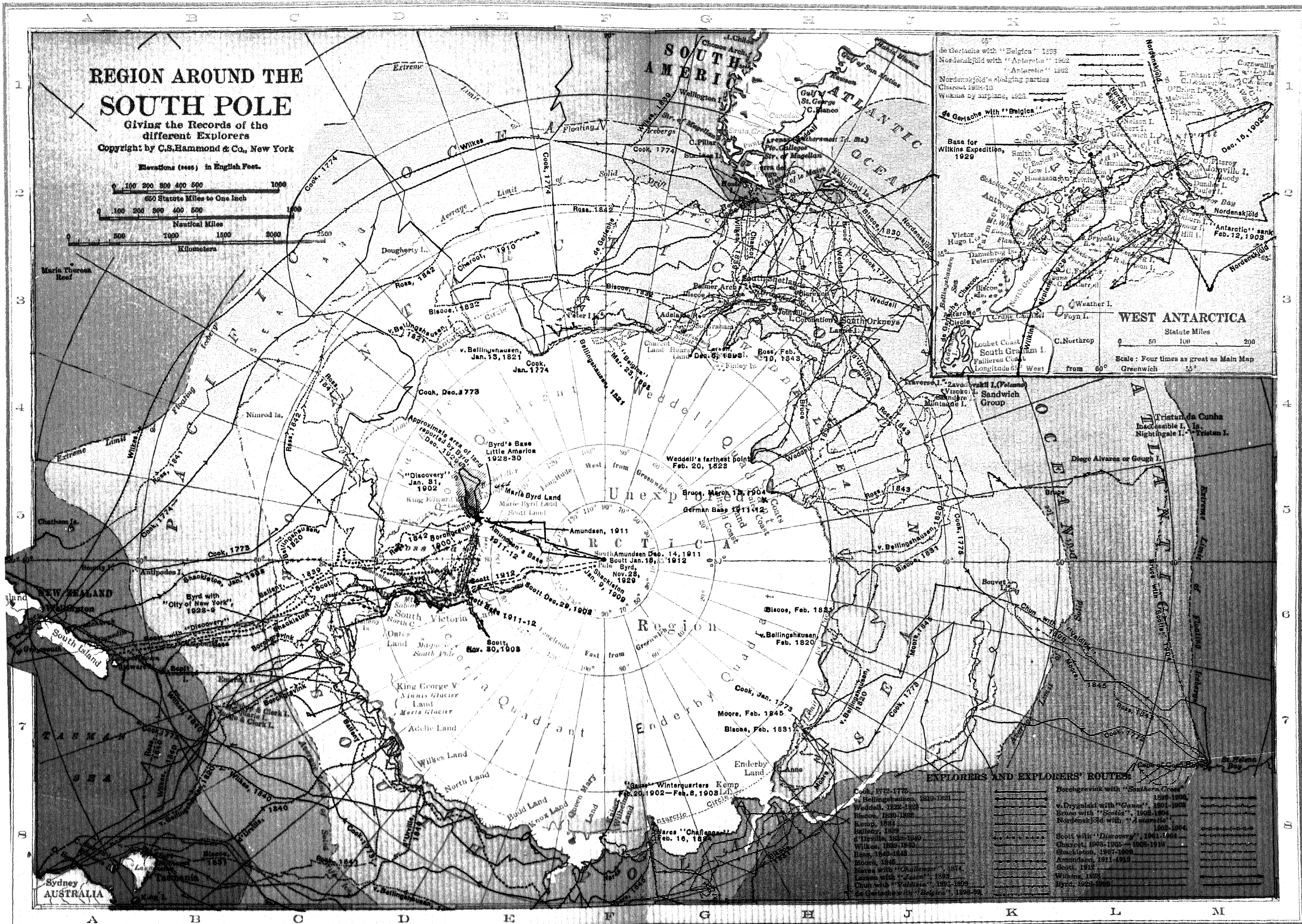
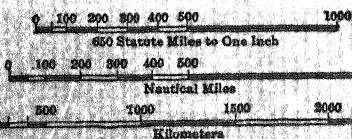
REGION AROUND THE SOUTH POLE

Active Sound.....	M 2	Diego Alvarez or Gough Island.....	L 5	Little America, Byrd's Base.....	D 5	Saint George, Gulf of....	H 1
Adare, Cape.....	D 6	Dougherty Island.....	D 3	Lockyer Island.....	L 1	Saint Helena Bay.....	M 7
Adelaide Island.....	G 3	Drake Strait.....	G 3	Lookout, Cape.....	M 1	Sandwich Group.....	K 4
Adele Land.....	D 7	Drygalsky Bay.....	L 3	Loubet Coast.....	K 3	Santa Cruz.....	G 1
Andvord Bay.....	K 2	Dundee Island.....	M 2	Louis Philipp Land.....	L 2	Santa Inez Island.....	G 2
Anne, Cape.....	H 7	Dunedin.....	A 6	Low Island.....	K 2	Saunders Island.....	J 4
Antarctica.....	F 5	D'Urville Island.....	L 2	Loyds Cape.....	M 1	Schollart Channel.....	K 2
Antarctic Ocean.....	D 3	Elephant Island.....	M 1	Luitpold Coast.....	G 5	Scott Island.....	C 6
Antarctic Sound.....	L 2	Enderby Land.....	G 7	McCarroll, Cape.....	L 3	Scott Land.....	E 5
Antipodes Island.....	B 6	Enderby Quadrant.....	G 7	McFarlane Strait.....	L 1	Scrapps Island.....	G 4
Antwerp Island.....	K 2	Erebus and Terror Bay.....	M 2	Macquarie Island.....	C 7	Sea Tang.....	C 3
Aspland Island.....	M 1	Evans Inlet.....	L 3	Magellan, Strait of.....	G 1	Seymour Island.....	M 2
Astrolabe Island.....	L 2	Falkland Islands.....	H 2	Magnetic South Pole.....	D 6	Sidney Herbert Sound.....	M 2
Atlantic Ocean.....	J 1	Fallies Coast.....	K 3	Maire, Straits of le.....	H 2	Smith Cape.....	K 2
Auckland.....	A 6	Field Strait.....	L 1	Marie Byrd Land.....	E 5	Smith Island.....	K 2
Auckland Island.....	B 7	Finley Islands.....	G 4	Maria Theresa Reef.....	A 3	Snow Hill Island.....	M 2
Australia.....	A 8	Fitzroy, Cape.....	M 2	Melville, Cape.....	M 1	Snow Island.....	K 2
Bahia Blanca.....	J 1	Flanders Bay.....	K 2	Mertz Glacier.....	D 7	Sobral, Cape.....	L 2
Ballyn Islands.....	D 6	Flinders Island.....	A 8	Montague Island.....	J 4	South America.....	G 1
Barlow, Cape.....	K 2	Foyn Island.....	L 3	Moody, Cape.....	M 2	South Foreland.....	M 1
Barren Island, Cape.....	A 8	Francise, Cape.....	M 2	Morton Strait.....	K 1	South Graham Island.....	G 3
Bathurst.....	B 8	Franklin Island.....	D 6	Narrow Island.....	M 1	South Island.....	A 6
Bellingshausen Sea.....	K 3	Fritsche, Cape.....	L 3	Nelson Island.....	L 1	South Orkneys Islands.....	J 3
Biscoe Islands.....	G 3	Gerliche Strait.....	K 2	New Year Island.....	H 2	South Polar Sea.....	D 8
Bishop and Clerk Island.....	C 7	Ghent Island.....	K 2	New Zealand.....	A 6	South Pole.....	F 5
Bismarck Strait.....	K 2	Gibb Island.....	M 1	Nightingale Island.....	L 4	South Shetlands (islands).....	H 3
Blanco, Cape.....	H 1	Good Hope, Cape of.....	M 7	Nimrod Islands.....	C 4	South Victoria Land.....	D 6
Bounty Island.....	A 6	Gough or Diego Alvarez Island.....	L 5	Ninnis Glacier.....	D 7	Staten Island.....	H 2
Bouvet Island.....	K 6	Greenwich Island.....	L 1	North Cape.....	A 6	Stefansson Strait.....	G 3
Bowles, Cape.....	M 1	Greyouth.....	A 6	North Cape.....	D 6	Stewart Island.....	A 6
Boyd Strait.....	K 2	Gunar, Cape.....	L 2	North Graham Island.....	G 3	Sydney.....	A 8
Brabant Island.....	K 2	Hearst Land.....	G 4	North Island.....	A 6	Table Island.....	L 1
Bransfield Strait.....	H 3	Hektoria Fjords.....	L 3	North Land.....	E 8	Tasmania.....	B 8
Briklmont Bay.....	L 2	Hermite Island.....	G 2	Northrop, Cape.....	L 3	Tasman Sea.....	A 7
Bridgman Island.....	M 1	Hobart.....	B 8	Oates Land.....	D 6	Tierra del Fuego (island).....	H 2
Budd Land.....	E 8	Hope Bay.....	M 2	O'Brien Island.....	M 1	Traverse Island.....	J 4
Byrd's Base, Little America.....	D 5	Horn, Cape.....	G 2	Orteans Channel.....	L 2	Trinity Island.....	L 2
Caard Coast.....	G 5	Hoseason Island.....	K 2	Pacific Ocean.....	B 5	Tristan Island.....	M 4
Campbell Island.....	B 6	Hoste Island.....	G 2	Palmer Archipelago.....	G 3	Tristan da Cunha Islands.....	M 4
Campbelltown.....	A 6	Inaccessible Island.....	L 4	Palmer Land.....	L 2	Troo, Cape de.....	K 3
Canadon.....	H 1	James Ross Island.....	L 2	Paulet Island.....	M 2	Ushuaia.....	H 2
Charcot Land.....	G 3	Joinville Island.....	H 3	Pendleton Island.....	L 2	Vega Island.....	M 2
Chatham Islands.....	A 5	Judge and Clerk Island.....	C 7	Peter I Islands.....	F 3	Victor Hugo Island.....	K 2
Chiloe, Island.....	G 1	Kaiser Wilhelm II Land.....	F 8	Petermann Island.....	K 3	Victoria Quadrant.....	E 7
Chonos Archipelago.....	G 1	Kemp Land.....	G 8	Pillar, Cape.....	G 2	Visokoi Island.....	J 4
Christchurch.....	A 6	King Edward VII Land.....	D 5	Port Stanley.....	H 2	Walker, Point.....	M 1
Clarence Island.....	H 3	King George Island.....	L 1	Possession Island.....	D 6	Weather Island.....	L 3
Coats Land.....	H 5	King George V Land.....	D 7	Puerto Gallegos.....	H 2	Weddell Quadrant.....	G 4
Cockburn Island.....	M 2	Knox Land.....	E 8	Punta Arenas.....	H 2	Weddell Sea.....	H 4
Cook Strait.....	A 6	Langtans Cape.....	L 2	Queen Mary Land.....	F 8	Wellington.....	A 6
Cornwallis Island.....	M 1	Larsen Bay.....	L 2	Robert Island.....	L 1	Wellington Island.....	G 1
Coronation Island.....	H 3	Launceston.....	B 8	Robertson Island.....	L 3	Wienke Island.....	K 2
Coulman Island.....	D 6	Laurie Island.....	H 3	Rockefeller Range.....	E 5	Wilhelmina Bay.....	L 2
Crane Channel.....	K 3	Liege Island.....	K 2	Ross Island.....	D 6	Wilkes Land.....	D 7
Crown Prince Gustave Channel.....	L 2	Lindenberg Island.....	L 3	Ross Quadrant.....	E 4	William, Mount.....	K 2
Danco Coast.....	L 2			Ross Sea.....	D 5	Zavodovskii Island (volcano).....	K 4
Dannebrog Islands.....	K 3			Rugged Island.....	K 1		
Deception Island.....	L 2			Sabine, Mount.....	D 6		

REGION AROUND THE SOUTH POLE

Giving the Records of the different Explorers
Copyright by C.S. Hammond & Co., New York

Elevations (feet) in English Feet.



EXPLORERS AND EXPLORERS' ROUTES

Explorer	Expedition	Year
Cook	1774-75	1774-75
de Gerlache	with 'Belgica'	1898-99
Nansen	with 'Fram'	1893-96
Amundsen	1911-12	1911-12
Scott	1911-12	1911-12
Byrd	1928-30	1928-30
Shackleton	1906-07	1906-07
Chapman	1905-06	1905-06
Wilkes	1838-40	1838-40
Ross	1842-43	1842-43
Moore	1845	1845
Blanco	1851	1851
Admiral	1859	1859
Chapman	1905-06	1905-06
Wilkes	1838-40	1838-40
Ross	1842-43	1842-43
Moore	1845	1845
Blanco	1851	1851
Admiral	1859	1859
Chapman	1905-06	1905-06
Wilkes	1838-40	1838-40
Ross	1842-43	1842-43
Moore	1845	1845
Blanco	1851	1851
Admiral	1859	1859

many species of fishes. (Each animal group named is described in these volumes.)

Antarctic Seas. The name Antarctic Ocean is usually given to the waters surrounding the Antarctic continent, but many modern geographers prefer to consider these waters as the southern ends of three separate bodies, the Atlantic, Pacific, and Indian oceans. Between the Antarctic lands and the southern ends of the other continents is an unbroken belt of water, varying in width from 600 miles, off Cape Horn, to 2,400 miles, off Cape Agulhas, the southern extremity of Africa.

There are two great currents in the Antarctic waters. One flows northward, between longitude 120° and 140° W., across the Antarctic Circle. As it approaches South America it divides into two; one part goes northward along the west coast, while the other continues eastward past Cape Horn and returns to the Antarctic near longitude 70° E. The second great current crosses the Antarctic Circle near longitude 90° E., and bending eastward, forms the West Australian Current. The water in the Antarctic Ocean has an average temperature, taking the year as a whole, of 29.8° at the surface and from 32° to 35° F. on the ocean floor.

Ice Formation. In the main, the ice forms of the Antarctic do not differ from those in north polar regions. The ice sheet covering the great land mass is more extensive and possibly thicker than that which covers Greenland. The icebergs are great floating blocks, some of them many acres in extent. Several have been seen which have a thickness of a thousand feet or more.

R.H.W.

Related Subjects. The reader is referred in these volumes to the following articles:

Aircraft	Currents, Ocean
Amundsen, Roald	Iceberg
Antarctic Circle	Polar Exploration
Byrd, Richard E.	Scott, Robert

ANTARES, *an ta' reez*, the largest known star in the stellar universe of which our solar system is a part. As measured with the interferometer at Mount Wilson Observatory, near Pasadena, Calif., Antares was found to possess a diameter of about 400,000,000 miles, or four hundred and fifty times the diameter of our sun. It is the brightest star in the constellation Scorpio (which see), a star group lying south of the celestial equator (see diagram *The Heavens in Spring and Summer* in the article ASTRONOMY, for relative location). This first-magnitude star shines with a deep-red light. It may be seen far down in the southern sky between sunset and midnight from May to October, but appears to best advantage late in June and through July. Antares is 350 light years from the earth. It has a companion star of a 'bright-green color. See STAR. F.B.L.

Related Subjects. For explanation of the term *light years*, see the article ASTRONOMY. See, also, the articles

20

BETELGEUSE; SCORPIO; STAR (How Star Distances May be Determined); INTERFEROMETER.

ANT COWS. See APHIDES.

ANT-EATER, a South American mammal, harmless and solitary, which sleeps during the day and seeks its tiny prey of white ants, or termites, at night. Its long, tapering head, small eyes, and short, round ears, in contrast



Photo: P & A

THE ANT-EATER

The specimen here illustrated was photographed in the Saint Louis (Mo.) zoo. Its keeper cannot supply him with ants, naturally, but finds that an acceptable food substitute comprises milk, eggs well beaten, and a little chopped meat.

with its bushy, black tail, give it a weird appearance. Its long tongue can be rapidly thrust out; it is covered with a sticky saliva which holds fast any ants which it touches—a natural “sticky fly paper.” The animal has no teeth.

The ant-eater, from tip to tip, is from four to seven feet long. Its head and tail form much more than half this length. It has powerful, long claws, with which it digs into ant hills and which serve as formidable defensive weapons. Most of the animal's body is covered with fur.

L.H.

[The name *ant-eater* is sometimes given to the *aard-vark*, and that of *porcupine ant-eater* to the Australian *echidna*.]

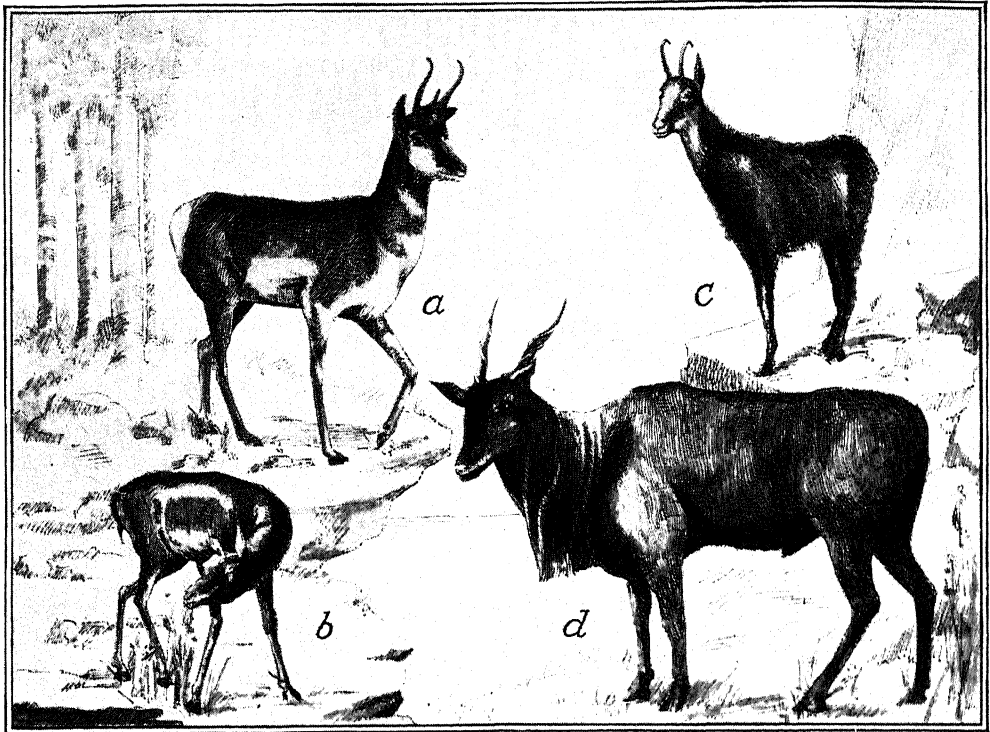
Scientific Name. The ant-eater described above belongs to the family *Myrmecophagidae*. It is known as *Myrmecophaga jubata*.

Related Subjects. The reader is referred in these volumes to the following articles:

Aard-Vark	Echidna	Edentata
Armadillo		Termites

ANTELOPE, *an' te lope*, the name given to a large group of horned, swift-footed animals found chiefly in Africa and Asia. They belong to the same family as sheep, goats, and oxen, but differ greatly from any of these animals. Antelopes are the most graceful and the fleetest of animals. Shy and timid, they are quite defenseless against flesh-eating animals and trust only to their speed when attacked. They possess slender, usually cylindrical, horns, which, unlike those of the deer, are not shed annually, but are permanent (see MOLTING).

Antelopes differ greatly in their manner of life. Some live on open plains, some in forests



THREE OF THE ANTELOPES

(a) Male pronghorn; (b) female pronghorn; (c) chamois; (d) eland.

and shady nooks. Mountainous regions are the favorite haunts of some species, and others are found only in well-watered valleys. As regards size, they vary from a foot in height to nearly the size of a horse. These animals are not so numerous as formerly, for they are everywhere in danger of being hunted out of existence. In many parts of Africa, whole herds numbering many thousands have been destroyed as recklessly as the bison was exterminated in North America. Some of the most beautiful species are found only on private estates.

Species of Antelope. Characteristic species include the following: the swift-footed *addax* of Africa and Arabia; the *eland*, the largest of African antelopes; the graceful *gazelle* of Africa and Asia; the odd-shaped *gnu*; the *koodoo*, with twisted, screwlike horns and vertical stripes; the ungainly *hartebeest*; the active *springbok*; the little dik-dik, and the small *steinbok*.

The *chamois* of the Old World and the *Rocky Mountain white goat*, locally called antelope, belong to the goat antelope family. Another so-called American antelope is known as the *pronghorn*.

W.N.H.

Classification. True antelopes belong to the family *Bovidae*. For scientific names of the antelopes named above, see articles on these species.

Related Subjects. The various species of true antelopes and those known locally as antelopes, described in these volumes, will be found under the following titles:

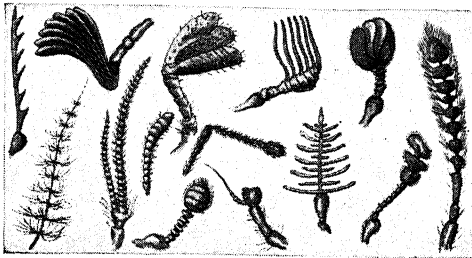
Addax	Koodoo
Chamois	Pronghorn
Eland	Rocky Mountain
Gazelle	White Goat
Gnu	Springbok
Hartebeest	Steinbok

ANTENNA, an ten' ah. See RADIO COMMUNICATION.

ANTENNAE, an ten' ee (plural of *antenna*), are long, delicate, jointed organs projecting from the heads of insects, in front of or between the eyes. Each insect has one pair of these *feelers*, as they are commonly called. Being supplied with numerous nerves connected with the brain, the antennae are truly very sensitive feeling organs, but they also have other purposes. Tiny pits imbedded in the antennae are the organs of smell in some insects. June beetles have nearly 80,000 of these pits. The antennae of male mosquitoes are beset with hairs which are sensitive to sounds. These insects find their mates by their antennae. Some insects, not being provided with ordinary organs of sight, use their antennae as eyes. Antennae vary greatly in form, as shown in the accompanying illustration. Some are feathery, some threadlike. Those of butterflies look like horns with knobs on the ends.

Crustaceans, represented by the crawfish and lobster, and myriapods, such as centipedes and millipedes, are also provided with antennae. The crustaceans (which see) always have two pairs.

W.J.S.



ANTENNAE

A few of the different forms, highly magnified.

ANTERIOR POLIOMYELITIS, *pah'li o mye li' tis*, the scientific name for infantile paralysis (which see).

ANTHER. See FLOWER (Flower Structure).

ANTHOLOGY, *an thol' o jie*, from Greek words meaning *flower-gathering*, is a book made up of selections from the best writings of many authors. It was this meaning of the word which suggested to Montaigne the following lines in the preface to a miscellaneous collection of poems:

I have gathered me a posie of other men's flowers, and nothing but the thread that binds them is mine own.

Though the great historic anthologies have been collections of poems, the term as popularly used includes both prose and poetry.

The word *anthology* was first applied to a collection of Greek poems selected by Meleager, a Syrian, about 80 B.C., but the Chinese *Book of Songs*, supposed to be the work of Confucius, is said to be the oldest anthology known to man. The Arabs, Persians, Turks, Japanese, and Hindus have numerous anthologies, some of which are of very early date.

[The standard English anthology is F. T. Palgrave's *Golden Treasury*. Other valuable collections are Trench's *Household Book of English Poetry*, Emerson's *Parnassus*, Quiller-Couch's *Oxford Book of Verse*, and Stedman's *Victorian Anthology and American Anthology*. Anthologies of modern short stories, poems, and plays are now published at frequent intervals, and are too numerous to be listed here.]

ANTHONY, SAINT, OF THEBES (about 251-356), one of the greatest of the early fathers of the Catholic Church, revered as the founder of the first monastery. Born of wealthy parents in Upper Egypt, he early obeyed the divine call to give up a worldly life, and, having given to the poor all that he possessed, retired to the desert near Thebes. After spending many years in fasting, prayer, and meditation, he was asked to leave his retreat in order that others might live under his direction, and in the year

305 he founded a monastery at Fayum, near Memphis, the beginning of the monastic system of the Catholic Church. At his death his disciples numbered 15,000. See MONASTICISM.

ANTHONY, SUSAN BROWNELL (1820-1906), one of the great leaders of the cause of woman's advancement, founder of the first state Women's Temperance Society and one of the founders of the National Woman's Suffrage Association. She was born at Adams, Mass., of Quaker parents, taught school for fifteen years, and in the meantime became active in the temperance and anti-slavery movements.

In 1868 she founded *The Revolution*, a periodical devoted to women's rights, and in 1869 organized, with Mrs. Elizabeth Cady Stanton, the National Woman's Suffrage Association, of which she was president for many years. Miss Anthony was arrested, tried, and fined in 1872 for attempting to vote, under the Fifteenth Amendment, in New York. As a lecturer and advocate, she spoke to vast audiences in all parts of England and the United States, and she was a frequent contributor to magazines. See WOMAN SUFFRAGE; STANTON, ELIZABETH CADY.



Photo: Brown Bros.

SUSAN B. ANTHONY

Revered pioneer in the now-popular cause of woman suffrage.

ANTHRACENE, *an' thra seen*. See COAL TAR (Derivatives).

ANTHRACITE, *an' thra site*, COAL. See COAL.

ANTHRACNOSE, *an thrak' nose*. See BEAN (Enemies).

ANTHRAX, *an' thraks*, an acute infectious disease of animals which may be communicated to man. Although the disease has been known since the time of the ancients, its causal organism, a spore-producing bacterium, was not isolated until 1849. Cattle and sheep show infection by fever and weakness, staggering and collapse. In a severe attack, the victim quickly goes into convulsions, which are terminated by death. Swine are usually attacked in the throat and die of suffocation. Horses, dogs, cats, and birds also are susceptible to the disease. Postmortems show a greatly enlarged spleen filled with blackened blood, whence has come the name *splenic fever*. Thorough disinfection should follow every case of the disease. If the bodies of animals dying of anthrax are not burned, water and soil are liable to be contaminated. The germs are easily carried by birds or flies, and the terrible disease may then be communicated to human beings. Ani-

mals may be rendered immune by inoculation with a prepared vaccine.

In man the disease takes the form of a severe inflammation of the skin and lymph vessels, with swelling and tenderness, when infection enters through cuts or scratches. If the spores are introduced into the digestive tract through the agency of flesh or milk from diseased animals, serious internal symptoms result, with convulsions and hemorrhage. Anthrax is sometimes acquired through the use of infected shaving brushes. It is also called *wool-sorter's disease*.

ANTHROPOID, *an' thro poyd*. See **APE**.

ANTHROPOLOGY, *an thro pol' o jie*, literally, is the science of man, the word being derived from the Greek *anthropos*, meaning *man*, and *logos*, meaning *science*. The term has been given various meanings, as the study of man's past has developed, but it now includes the development of man as a race, his appearance on the earth, and his progress toward modern culture; in other words, the distribution of man over the earth and the results of the distribution. The departments of anthropology are archaeology, ethnology, and ethnography. See, also, **BIOLOGY**.

Related Subjects. The following list does not attempt to exhaust the possibilities of anthropology, but it includes all of the peoples separately treated in these volumes, as well as a number of articles on manners and customs in all parts of the world. The sections on *People* in the articles on the various countries should also be read in connection with this study:

PEOPLES

Aborigines	Hottentots
Achaeans	Huns
Aino	Igorrote
Aleuts	Indians, American
Angles	Ionians
Anglo-Saxons	Jews
Arab	Jutes
Aryan	Kaffirs
Aztec	Kalmucks
Bantu	Kanakas
Basque	Kirghiz
Bedouins	Letts
Berber	Lombards
Boer	Magyars
Bushman	Mahrattas
Cannibal	Mandingo
Cave Dwellers	Maoris
Celts	Matabele
Cimbri	Maya
Circassians	Mongols
Cliff Dwellers	Moors
Copts	Mound Builders
Cossacks	Mulatto
Creole	Neanderthal Man
Czech	Negritos
Dorians	Negro
Druids	Normans
Dwarfs	Northmen
Dyaks	Picts
Eskimo	Pigmies
Franks	Ruthenians
Gael	Sabines
Gentiles	Samnites
Giants	Saracens
Goths	Saxons
Gypsy	Semites
Helvetii	Slavs

Slovaks
Tartars
Teutonic Races

Turks
Vandals
Walloons

The various Indian tribes are listed in an index with the article **INDIANS**.

MANNERS AND CUSTOMS

Ban	Nomad Life
Banshee	Omens
Barbecue	Ordeal and Combat
Blood, Avenger of	Ostracism
Blood-money	Peonage
Cannibal	Polygamy
Caste	Salutations
Clan	Suttee
Fetish	Taboo
Fire Worship	Tattooing
Harem	Vendetta
Marriage	Witchcraft
Names, Personal	Zenana

The following general articles will also be found helpful and interesting.

Archaeology	Kitchen Middens
Bronze Age	Lake Dwellings
Ethnography	Man
Ethnology	Mongolia (Early Home of Man)
Folklore	Races of Men
Human Period	Stone Age
Iron Age	

ANTHROPOMORPHISM, *an thro po mor'-fiz'm*. See **MYTHOLOGY**.

ANTI-AIRCRAFT GUNS. See **ARTILLERY**.

ANTI-BACTERIAL, *an ti bak te' ri al*, **SERUMS**. See **SERUM THERAPY**; **ANTITOXIN**.

ANTICHRIST, a term which covers a rather uncertain belief, but in general, considered to be an antagonist sufficiently powerful to fill the world with wickedness, but destined to be subdued forever by Christ at his second coming (see *John* II, 18, 22). From the beginning of the Christian Era, men have endeavored to identify the Antichrist named by John. Early Christians thought they had found him in the person of Nero; medieval churchmen identified him as Mohammed; Luther and many early Protestants professed to see him in the person of the Pope. Modern thinkers see him only as a personification of evil, but there are religious bodies of to-day that interpret the statement in *John* literally.

ANTI-CIGARETTE LEAGUE OF AMERICA, an organization with branches in most of the large cities of the United States, Canada, and the Panama Canal Zone. Its membership includes more than 500,000 boys and men who have pledged themselves to abstain from liquor and tobacco in every form "and to use their influence to induce others to abstain." The pledge may be made binding for life, or only until the age of twenty-one.

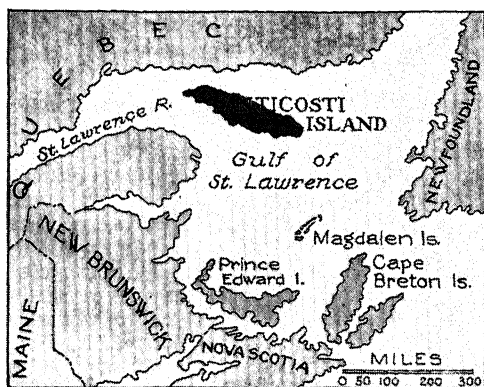
This organization is the outgrowth of a local league started in Chicago in 1899 by Miss Lucy Page Gaston, a Chicago woman who spent many years in a crusade against the rapid spread of the cigarette habit. The League is supported by membership fees of ten cents each and by voluntary contributions, and its active members are entitled to wear a button.

This is a symbolic design in gold wash. Girls and women are invited to join the League as auxiliary members.

The League publishes a variety of literature in furthering its work. It does not confine itself to educational campaigns among boys, but takes an active share in promoting legislation against the sale of tobacco to minors and in influencing public opinion to demand rigid enforcement of such laws. It also has free clinics, at which those who cannot rid themselves of the cigarette habit may find aid, without expense. Medical treatment and diets which will help to do away with the craving for cigarettes are recommended by able physicians, and representatives of the League visit schools and churches for the purpose of offering such aid to boys.

ANTICOSTI, *an ti kahs' tie*, a rocky island in the Gulf of Saint Lawrence, once the largest private game preserve in North America. Geographically it is a part of the province of Quebec, but in 1895 it was sold by the government to M. Menier, the French manufacturer of chocolate. Menier later sold it to a large lumbering company.

Anticosti is a resort for wild game, and the adjacent waters are filled with salmon, trout, cod, and herring. The climate is severe, frosts



LOCATION MAP

being common even in midsummer. The island is of interest to geologists as one of the best examples of the transition between the Ordovician and Silurian systems (see **GEOLOGY**). Its area is 3,147 square miles, about one and a half times as large as the area of Delaware. There are numerous lighthouses, whose keepers, with the lumbermen, comprise most of the population. See **SAINT LAWRENCE, GULF OF**.

ANTI-CYCLONIC STORMS. See **STORMS; CYCLONE**.

ANTIDOTE, *an' ti dote*, a substance which neutralizes another substance. The antidotal action may be chemical or physiological. An illustration of the first is the use of wall scrapings or other alkali in the treatment of poison-

ing by acids; of the second, the use of atropin and coffee in the treatment of poisoning by opiates.

First Aid in Poisoning. In a general case of poisoning, a physician should be summoned at once. The next step is to empty the stomach. This may be done by tickling the back of the throat with the finger or with a feather. A glass of warm salt water will sometimes cause vomiting. Ipecac by the mouth or apomorphia (a powerful emetic) by hypodermic may be used. Since quick action is required, the finger-in-the-throat method should always be used.

In poisoning known to be due to strong acids or alkalis, vomiting should not be induced until the stomach contents have been neutralized by alkalis or acids, as the poisoning requires.

Shock should be treated by the application of heat. Pain should be treated with morphine, preferably hypodermically given.

Special Treatment. Alcohol poisoning may be fatal. Wash out the stomach thoroughly; use emetics, in addition to the stomach pump, then give a glass of milk. Coffee is of service. Apply cold to the head and heat to the feet; use artificial respiration, if required.

Poisonings with Acids. Do not use the stomach pump. Neutralize the stomach contents with alkalis before inducing vomiting. Give plaster scraped from the wall, or soapsuds, or any other simple accessible alkali. Follow with white of eggs, milk, starch, flour, or oils.

Oxalic Acid. Same as acids; do not use baking soda or washing soda.

Alkalies, such as lye, soaps, ammonia, caustic potash, or caustic soda. Give vinegar, lemon juice, sour milk, or any other simple accessible acid or sour substance. Follow with white of egg, milk, flour, or oils. Do not use the stomach pump.

Bichloride of Mercury, or Corrosive Sublimate. Give white of egg. Follow this by washing out the stomach within ten minutes, or give ipecac in full doses by mouth, or apomorphia hypodermically.

Carbolic Acid. Cause vomiting, then wash out the stomach with diluted alcohol. Dissolve one ounce of epsom salts in half pint of water. Give white of egg. Do not give oil or any grease.

Carbon-Monoxide Poisoning, or garage poisoning, automobile-gas poisoning, and lighting-gas poisoning. Induce artificial respiration by the prone pressure method. If gas can be used for inhalation, let it be a mixture of 95 parts oxygen and 5 parts carbonic-acid gas. Give warm coffee by mouth or by the rectum.

Chloral, or Knock-out Drops. Wash out the stomach thoroughly. Give coffee by stomach and by rectum; apply heat locally.

Arsenic, Rough-on-Rats, Paris Green. Wash

out the stomach, give a tablespoonful of dialyzed iron every half hour for four doses. Follow with raw eggs, flour in water, and oils.

Metallic Poisons, such as copper, mercury, brass. Wash out the stomach. Give a five per cent solution of borax in water, then wash out the stomach again. Give white of egg, milk, or flour, in water; white of egg is preferred.

Borax, and boracic-acid poisoning. Give dialyzed iron. Wash out the stomach. (Boracic acid applied to the skin or injected into a cavity, such as the chest, is much more poisonous than when taken internally. In poisoning due to such use, inject iron salts or apply them locally).

Chlorine Poisoning. Give ammonia water in small doses, well diluted; wash out the stomach; give white of egg.

Coal Oil, kerosene, gasoline. Wash out the stomach; give milk.

Cocaine. Wash out the stomach with a weak solution of potassium permanganate.

Opiates, including morphine. Wash out the stomach, using a weak solution of potassium permanganate. Give coffee by mouth and by rectal injection; apply heat locally.

Phosphorus, match poisoning. Wash out the stomach, using a weak solution of potassium permanganate. Give large doses of mucilage. Follow with a dose of salts. Do not use any fats, oils, or greases.

Iodine. Wash out the stomach with flour or starch water; follow with a dose of hyposulphite of soda. Give mucilaginous drinks.

Strychnine, *nux vomica*. Wash out the stomach. Control convulsions with chloral, bromides, or morphine.

Lead Poisoning. Wash out the stomach. Give epsom salts and milk freely. W.A.E.

ANTIETAM, *an te' lah'm*, BATTLE OF. See WAR OF SECESSION.

ANTI-FEDERALIST PARTY, a political organization formed in the United States when the adoption of the Constitution was an issue before the people. Those favoring adoption took the name of *Federalists*. The Anti-Federalists opposed the Constitution in the form in which it was presented for acceptance, because they believed that it called for too strong a central government, one which would deprive the states of freedom of action in many directions (the issue of states' rights). After the adoption of the Constitution, they favored a strict construction, or strict interpretation, of that instrument, and declared for strong state governments. Thomas Jefferson was their leader. Later the name of the party was changed to Republican, then to Democratic-Republican, and finally to Democratic. See POLITICAL PARTIES; STATES' RIGHTS.

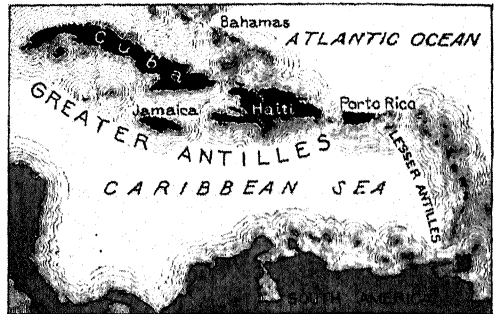
ANTIGONE, *an tig' o ne*, one of the most attractive characters of Greek mythology, the

constant, devoted attendant of her father Oedipus (which see). When her brother Polynices was put to death, she was ordered not to bury his body, and because she disobeyed she was shut up alive in a tomb. Her story is told in the *Antigone* of Sophocles. See OEDIPUS.

ANTIGUA, *an tig' u ah*, largest of the Leeward Islands (which see), and also the name of the capital city of the group.

ANTI-LEBANON. See LEBANON, MOUNTAINS OF.

ANTILLES, *an til' leez*, another name for the West Indies, or, more usually, for all of the islands except their northernmost portion, the Bahamas. The *Greater Antilles* are Cuba,



GREATER AND LESSER ANTILLES

The principal islands are shown in black.

Jamaica, Haiti, Porto Rico, and the less important neighboring islands, like the Isle of Pines. The *Lesser Antilles* include the necklace of islands from Porto Rico to the South American coast, among them Martinique, Saint Thomas, Trinidad, and Barbados. See WEST INDIES.

ANTI-MASONIC PARTY. An instance of intrusion of local issues in the United States into the domain of national political life may be cited in the Anti-Masonic party. In 1826, a man named William Morgan declared his intention of publishing a book revealing all the secrets of Masonry, of which order he had been once a member. On a petty charge having no relation to this issue, he had suffered brief imprisonment. On the night of his release, he was hurriedly taken to Niagara in a closed carriage by unknown captors, and was never again seen or heard from.

The mystery of his disappearance and the alleged motive therefor created the greatest possible sensation and raised in the minds of many people strong prejudice against the Masonic fraternity, which was openly charged with criminal knowledge of Morgan's fate. Their prejudice extended into politics, thousands of citizens refusing to vote for Masons for any public office. This feeling led the Republican party of the state of New York to

offer to voters a state ticket upon which the name of no Mason appeared. An Anti-Masonic party ticket was named in opposition, and while the new party drew but few votes in that canvass, it increased rapidly thereafter in strength.

In 1831 the Anti-Masons nominated a national ticket, which secured the electoral vote of Vermont, and in 1835 its nominee for governor in Pennsylvania was elected. Soon thereafter its strength waned, and its most devoted partisans turned to the Whig party (which see), in which organization they were for some years a strong factor. See **POLITICAL PARTIES**.

ANTI-MONOPOLY PARTY, a political organization in the United States whose name expressed its platform of principles. Its period of greatest activity was in 1884, in which year it held a national convention in Chicago and named Benjamin F. Butler, of Massachusetts, for President of the United States. The platform adopted demanded a government administered with economy, the enactment and enforcement of laws which would equitably distribute burdens said to be borne largely by the poorer classes, an income tax, payment of the national debt as it matured, and the election of United States Senators by direct vote of the people. The ticket polled 130,000 votes, but the party at once disbanded. See **POLITICAL PARTIES**; **BUTLER, BENJAMIN F.**

AN'TIMONY, a brittle, metallic element, of a silver-white color, which does not rust or tarnish when exposed to the air. Pure antimony is from 6.6 to 6.7 times as heavy as water, and melts at a temperature of 830° to 840° F. When alloyed with other metals (see **ALLOY**), it hardens them, and it is therefore used in the manufacture of such materials as Britannia metal, type metal, and pewter. It renders the sound of bells clearer and more sonorous; it makes tin whiter as well as harder, and makes the types for printing firmer and smoother.

The ancient Egyptians and other Oriental peoples used antimony for painting their eyebrows and eyelashes, and certain brilliant-red pigments or colors used in oil painting, in dyeing, and in the manufacture of safety matches and fireworks are still made from it. Compounds of antimony are also used in vulcanizing rubber, in glass manufacture, and in the preparation of white enamel and furniture polish. Many of the salts of antimony are poisonous, and have an effect similar to that of arsenic. Antimony is used in the preparation of tartar emetic and other medicines. See **ANTIDOTE**.

Antimony is sometimes found in its pure state. For commercial purposes, however, it is derived chiefly from *stibnite*, which is about seventy-two per cent antimony and twenty-eight per cent sulphur. The symbol of antimony is *Sb* (see **CHEMISTRY**). *Stibnite* is mined in Austria, France, Germany, Italy, China,

Japan, and other countries. It is also found in the United States, but is not profitable to mine because of the low price of the metal. Most of the antimony used in Canada and the United States is imported, but small quantities are obtained in the smelting of lead ores, which frequently contain it. T.B.J.

AN'TIOCH. See **SYRIA** (The Cities).

ANTIPATER, *an tip' a tur*, OF **SIDON**, compiler of the earliest list of the Seven Wonders of the World (which see).

ANTIPODES, *an tip' o deez*, the name given people who are on exactly opposite parts of the earth. The name means *feet to feet*. Our antipodes have their feet pointing toward us and their heads away from us. To find the antipodes of any point, take a globe and see where the axis, inserted at that point and extended through the center of the globe, will appear on the opposite side.

Antipodes Island, a small island in the South Pacific Ocean, 460 miles south by east of New Zealand. It is so called because it is almost directly opposite London, England. R.H.W.

ANTI-POPE. See **POPE**, subhead.

ANTIPYRINE, *an ti pi' rin*, a white, crystalline powder of bitter taste, used medicinally for the relief of pains, especially those of a neuralgic nature. It is also given to check spasmodic effects in whooping cough. Antipyrine makes the heart beat slower, and formerly was prescribed as a remedy for fever, but is little used for that purpose now. Preparations containing antipyrine should not be taken without competent medical advice, because the effects of the drug are rapid and powerful.

Antipyrine is a derivative of coal tar, and is a compound of carbon, hydrogen, oxygen, and nitrogen. It is soluble in water and very readily soluble in alcohol.

ANTI-RENTERS. The patroon system of government once in vogue in Holland and introduced into America by Dutch settlers was responsible in the first third of the nineteenth century for an organization known as Anti-Renters. From about 1840 to 1848 they held the balance of political power in the state of New York. Large estates belonged to the original settlers in that part of the country, the old Dutch patroons. These estates had from the first been subdivided and rented out to tenants, who held perpetual lease and paid for their tenancy in produce. After several generations, the tenants became dissatisfied with this arrangement, and felt that they rightfully owned the land which had been for so long the homes of their forebears.

The descendant of one of the old patroons named Van Rensselaer attempted in 1839 to collect certain rents which had been long in arrears, and met with armed opposition. Renters disguised as Indians terrorized the region;

attempts by the sheriff to force collections were invariably defeated; the militia was summoned, but was largely outnumbered. So strong were the anti-renters that for a number of years they dictated political affairs, defeating with ease any party which did not bend to their will. The trouble subsided only with the sale of the farms to the tenants on satisfactory terms. See PATROON SYSTEM.

ANTI-SALOON LEAGUE, an organization opposed to the liquor traffic, first organized as a state body in Ohio in May, 1893, and soon established in every state in the Union. It is not a membership body, but the basis of its existence rests in boards of trustees, the members of which are appointees from various religious denominations. It is not a partisan body, but works through all political parties and all religious denominations. It does not concern itself with questions other than those having to do directly with the traffic in intoxicating liquors. Its method originally was to unite all organizations and influences opposed to the liquor traffic and to use their combined influence to secure laws to restrict and ultimately to prohibit the traffic in beverage intoxicants.

There is a national organization known as the Anti-Saloon League of America, fully officered, with headquarters at Westerville, Ohio, and Washington, D. C. Each state has its own superintendent and a board of managers, which usually includes representatives from all political parties and religious denominations.

Since the passage of the Eighteenth Amendment and the Volstead Act, the League has strongly emphasized the importance of observing and enforcing the prohibition laws, and has worked to secure those ends. A new department of education, publicity, and research has been established, which has its counterpart in the work of the state leagues. S.E.N.

Related Subjects. The reader is referred in these volumes to the following articles:

Local Option	Temperance
Prohibition	Volstead Act

ANTISANA, *an ti sah' nah*, an Andean peak. See SOUTH AMERICA (Plains and Mountains).

ANTISEPTIC, *an ti sep' tik*, an agent which kills the microorganisms which cause decay and which infect man and the lower animals. Nearly synonymous words are germicide and disinfectant. The term is used with or without an adjective as applying to chemicals, as distinguished from agencies such as drying, the action of light, the action of heat and cold, and death of bacteria due to the action of other bacteria or of the products of bacteria.

The use of chemicals, particularly salt and essential oils, as antiseptics in the preservation of foods, is as old as society. Their use for mummifying dead bodies dates back to and beyond the days of the Pharaohs. The laws

of Moses gave rather detailed directions for the use of antiseptics.

Antiseptics in Surgery. The systematic and scientific use of antiseptics began with the research and clinical work of Joseph Lister in 1865, or thereabouts. He based his methods on the discoveries of Louis Pasteur. Lister, being convinced that wounds became purulent (consisting of pus, or matter) because they were infected by bacteria, devised methods of operation through which no germs could enter wounds during or after operation.

Because of certain reports on the efficacy of carbolic acid as an antiseptic capable of purifying sewage and other organic matter, Lister employed that chemical as an antiseptic. He used it in the form of sprays to purify the air of the operating room; he washed the wounds with it, and he used it to sterilize instruments, sponges, and dressings. In the course of time the Lister method has been greatly modified. Carbolic spraying of the air is not now done. Other antiseptics have largely replaced carbolic acid, and heat, rather than chemicals, is employed to sterilize dressings and instruments. In time, antiseptic surgery has changed into aseptic surgery.

Aseptic Surgery. This is defined as surgery in which the different instruments and agencies used are free from microorganisms. Antiseptic surgery is surgery in which the end sought is to kill germs that are in the wounds. During the World War there was a temporary revival of antiseptic surgery, because there were so many dirty and badly infected wounds. For this purpose, wounds were left more or less open, and a solution of hypochloride of lime (usually Dakin's fluid) was employed continuously or repeatedly to wash them out.

In the routine surgical procedure, dressings, sponges, and instruments are sterilized by moist heat (steam under pressure, boiling water, or hot oil). The surgeon washes his hands with soap and water, and then with an antiseptic. The site of the operation is washed with soap and water, then with ether or alcohol, and then painted with iodine or some other antiseptic.

Importance. The discovery of antiseptic action and of antiseptics outranks all other discoveries in the process of surgery. It is true that the discovery of anesthesia was of great importance, but not even the ability to alleviate pain does as much for surgery as does ability to protect against infection. Prior to the discovery of antiseptics and asepsis, surgery was almost limited to surgery of the limbs, and even compound fractures of the large bones were usually fatal. Thanks to antiseptics, surgery now offers relief to some ailments in every part of the body.

First-Aid Surgery, in Minor Wounds. In the first-aid treatment of minor wounds, the first step is to clean the wound and the near-by

tissues. If the wound is particularly dirty, benzine is employed for that purpose; soap and water are used particularly around the wound, rather than on it. The wound is painted both in and around with mercurochrome or with alcoholic iodine. How much it is then to be covered depends on the wound and its location. Simple, very small places can be left uncovered. Some small wounds can be sealed with collodion with safety; badly soiled wounds should not be sealed in, because of possible lockjaw or gas-bacillus infections. Such wounds should be lightly covered with gauze.

In Medicine. Antiseptics are of some service in medicine, as distinguished from surgery. Quinine is an antiseptic against the malarial parasite in the blood, and as such it is used. Arsenic and mercury have similar action against the syphilitic organism. A chemical antiseptic is given internally to destroy the bacteria in the urine as it is secreted. Various substances are used as intestinal antiseptics. The theory that they act as antiseptics in the lungs is responsible for the use of essential oils, turpentine, and balsams in cough medicines.

Public Health. There are many uses of antiseptics in the prevention of disease. Chlorine is used in drinking water to prevent typhoid fever and diarrhoea. Carbolic acid and other antiseptics are used in sterilizing excretions during illness, and in cleaning up afterward. Milk, meal, and canned foods are preserved by salt and sugar.

W.A.E.

Related Subjects. For supplementary information the reader is referred to the following articles:

Alcohol	Corrosive Sublimate
Bacteria and	Disease
Bacteriology	Hydrogen Peroxide
Boracic Acid	Lister, Sir Joseph
Carbolic Acid	Pasteur, Louis

ANTISTHENES, *an tis' the neez*, founder of the Cynic School of Philosophy (which see).

ANTITOXIC, *an ti tok' sik*, **SERUMS**. See **SERUM THERAPY**.

ANTITOXIN, *an ti tok' sin*, a substance which antidotes or neutralizes a toxin. Each antitoxin is a specific for some toxin. In some bacterial diseases, the body is harmed by poisonous secretions (toxins) secreted by the invading bacteria. The tissues react against this toxin by producing a neutralizing substance called an antitoxin. Antitoxins are used for the cure of specific diseases. We now have antitoxins for the cure of diphtheria, lockjaw (or tetanus), scarlet fever, snake poisoning, and erysipelas. The claims for antitoxins for pneumonia, tuberculosis, botulinus, and rheumatism are not established. Antitoxins are also used for the production of a temporary latent immunity to diphtheria. This immunity lasts less than one month.

In the preparation of some vaccines used in immunizing, a very small dose of antitoxin is added to some toxin to neutralize it, so that

immunity without disease can be induced. Most of the antitoxins now on the market are produced by inoculating horses with toxin or bacteria and later bleeding them and using the blood serum for the purpose of supplying antitoxin. In a few instances, sheep are used in place of horses.

W.A.E.

Related Subjects. For supplementary information, the reader is referred to the following articles:

Bacteria and	Lockjaw
Bacteriology	Scarlet Fever
Disease	Serum Therapy
Diphtheria	Vaccination

ANTI-TRUST LAWS. See **TRUST** (Trust Legislation).

ANTLER. See **DEER** (Kinds and Characteristics).

ANT LION. Many boys and girls like to watch the antics of an odd-shaped "bug" that digs a funnel-shaped pit as a trap for ants. They call it the "doodle bug," but books on insects give it the name *ant lion*. It is really the young, or larva, of a kind of fly. The doodle bug chooses for its pit sandy soil or loose, rotting material by an old log, preferring a place sheltered from rain. Its large, flattened head is used as a shovel to receive the sand or loose dirt, which it scoops up with a pair of outspread forelegs. Having crept into the soil backwards, it tosses the loosened dirt up, jerks its head back, throwing the material out of its way, then turns slightly and repeats the performance, and continues turning around until it has dug a little funnel, in the bottom of which it lies in wait for its prey. These funnels are sometimes two inches across and an inch or more deep. When an ant or other insect comes to the edge of the pit, the sides cave in and the victim, falling to the bottom, is impaled on the sharp points of the doodle bug's sickle-like jaws. After killing its prey, the captor sucks the juices of the body.

When full grown, the doodle bug constructs a silk-lined ball of sand, cementing it with a sticky substance from its own body. This is its cocoon, in which it pupates for about two months. The adult looks something like a dragon fly, having a long, slender body and two pairs of fragile, finely netted wings. W.J.S.

Classification. The ant lions, comprising hundreds of species, belong to the family *Myrmeleonidae*, and to the order *Neuroptera* (which see).

ANTONINUS, *an toh ni' nus*. **WALL OF.** See **ROMAN WALLS**.

ANTONY, *an' to nie*, **MARK**, in Latin, **MARCUS ANTONIUS** (83-30 B.C.), a great Roman orator, soldier, and statesman, the friend and lieutenant of Julius Caesar, and himself the ruler of half the Roman world after Caesar's death. Yet this man, before whom the noble "conscript fathers" of the Roman Senate trembled, to whom millions of people looked as their lord and master, could not command

himself. He gave free reign to his baser impulses, was untrue in turn to each of his four wives, and finally lost power and honor as the result of his infatuation for Egypt's queen, Cleopatra. He was probably the greatest of his day in everything he undertook, as soldier, statesman, ruler, debauchee. He ran the gamut of the vices and virtues.

Rise to Power.

Mark Antony belonged to an ancient and powerful patrician family, and before he was thirty he had been raised to an important position under Caesar, who was then in Gaul. After several years in Gaul, he returned to Rome and was elected tribune of the people; when civil war broke out,

he was expelled from the city as an adherent of Caesar. At the Battle of Pharsalia, by which Caesar became master of Italy, Antony was second in command, and on several later occasions he was left in supreme control at home while Caesar was in Gaul. In 44 B.C. he was consul with Caesar, and on Caesar's death was easily the foremost man in Rome. He sought to make himself a ruler great as Caesar, and led his soldiers, many of them veterans of Caesar's campaigns, against Brutus. While Antony was absent from Rome, young Octavius, later called Augustus Caesar, secured the support of the Senate, and leading new forces to aid Brutus, drove Antony across the Alps.

The Triumvirate. Octavius, however, angered by the Senate's action in giving Brutus supreme command, made terms with Antony, and later with Antony and Lepidus, a wealthy patrician, agreed to a plan to divide among themselves the Roman world. Antony was to receive Gaul; Lepidus, Spain; and Octavius, Sicily, Sardinia, and Africa. In the next year, 42 B.C., the triumvirate (government by three) established its power in Italy by a victory at Philippi.

Antony went to Greece, and then to Asia Minor, to complete the dominion of the triumvirate and arrange for payment of tribute. At Tarsus, Cleopatra, queen of Egypt, came to do him honor, and her charms completely captivated him. He followed her to Egypt, where he spent the winter in luxury, flattery, and self-admiration. He was roused from his dream by hostilities between his own brother and Octavius, and hurried to Rome only to find

Octavius victorious. The great leaders again became reconciled; Antony married Octavia, the sister of Octavius, and a new division of the world was arranged. Lepidus was disregarded, Antony taking the East, and Octavius the West, in a new alignment of forces.

Antony then spent several years in the East, without adding in any way to his fame. The call of Egypt then became irresistible, and he returned to Cleopatra, on whom he lavished kingdoms and provinces, to the disgust of Octavius and the Senate. Finally, in 32 B.C., the Senate declared war against Cleopatra, and after two years of preparation, its forces

were victorious in the Battle of Actium. The queen fled to Egypt, followed by Antony, and soon the two were pursued by Octavius. When the false rumor came to him that Cleopatra was dead, Antony threw himself on his sword.

In Literature. The story of Antony has been told by Shakespeare in *Julius Caesar* and in *Antony and Cleopatra*; many lines of the former are often quoted, especially the beginning of Antony's masterly oration to the people at the funeral of Caesar:

Friends, Romans, countrymen, lend me your ears;
I come to bury Caesar, not to praise him.

Related Subjects. Much information on Antony and his times will be found in these volumes in the following articles:

Actium	Gaul
Augustus	Lepidus
Brutus, Marcus Junius	Octavia
Caesar, Caius Julius	Patrician
Cleopatra	Tribune
Consul	Triumvirate

ANTONY AND CLEOPATRA. See SHAKESPEARE (Synopsis of the Plays).

ANTSIRABE, *ahnt se rah' bay*, a town in Madagascar (which see).

ANTWERP, *ant' wurp*, in French, ANVERS, and so designated on European maps, is the principal maritime city of Belgium and the greatest port of continental Europe. It lies on the winding River Scheldt, about fifty miles from the sea.

Chief Buildings. Among the buildings that have been preserved from the early period of its greatness, the most important is the cathedral. It is the largest, and many people consider it the most beautiful, Gothic church in Belgium. Its graceful and lofty tower, over



Photo: F. O. Bemm

CAESAR'S MOST ARDENT SUPPORTER

Mark Antony, sleek and fat, as depicted in a marble statue near the modern art gallery, in Vienna, Austria.

400 feet high, seen for a long distance, is a conspicuous landmark in the flat surrounding plain. The cathedral is famous for its artistic treasures, among which are the three celebrated masterpieces of Rubens—the *Descent from the Cross*, the *Elevation of the Cross*, and the *Assumption*. These great masterpieces were removed from the city for safety when the German "drive" through Belgium began in August, 1914.

The most important secular building is the town hall, built in the sixteenth century in the Renaissance style; it is rich in carved wood panel-work, mural decorations, and other works of art. Antwerp has a picture gallery which contains a fine collection of paintings of the Flemish school, the most famous being the priceless collection of paintings by Rubens and Van Dyck. One of the most interesting museums in the whole world is the Museum Plantin-Moretus. It was the house and workshop of the great printer Plantin, and contains a collection of everything pertaining to printing in its early stage.

Commerce and Industry. The harbor is spacious and is one of the finest in the world, the Belgian government sparing no expense to improve and equip it with all the most modern facilities for accommodating the largest steamers. Besides its vast trade, Antwerp has numerous and varied industries, among which are sugar-refining, lace-making, brewing, distilling, and shipbuilding; in diamond-cutting the city has become a rival of Amsterdam.

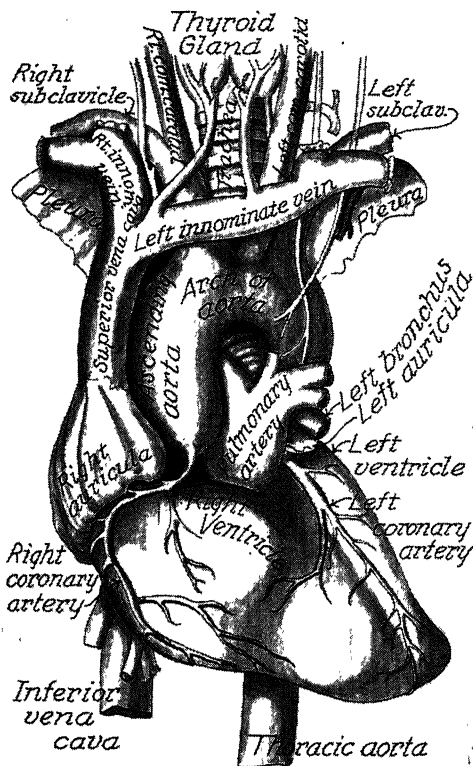
History. Antwerp began to attain a prominent position during the fifteenth century, when it became the chief port of the Hanseatic League (which see) and the great port of entrance for trade between the various parts of the Continent and England. In the sixteenth century it was the richest and most splendid city in the world, and the chief money market of Europe. It reached the height of its prosperity in 1560, when frequently as many as 500 ships entered the port in one day. Soon afterward the struggle of the Netherlands to gain its religious and political freedom from Spain, in which Antwerp took a prominent part, ruined its trade.

Antwerp declined continuously until 1800, when its population was below 40,000. Napoleon, realizing both the strategical and commercial value of its situation, decided to open and improve its harbor and to set it up as a rival to London. He considered that Antwerp in the hands of a powerful enemy would be "a revolver held at the breast of England." The trade of Antwerp began to grow very rapidly, but this lasted only until 1830; then Belgium became separated from Holland, and the latter country, controlling the estuary of the Scheldt, upon which Antwerp is located, imposed heavy tolls upon the river's shipping.

These tolls were finally abolished in 1863, and the city's trade at once experienced a rapid growth.

The World War. Antwerp had long been the pivot of the national defense of Belgium, and was one of the strongest fortresses in Europe. The city was considered almost impregnable, with its great fortified camp and its numerous detached forts. But the World War changed all former ideas as to the value of fortifications. The development of modern artillery enabled the Germans to capture Antwerp after a ten-days bombardment, beginning September 28, 1914. The large forty-two centimeter German siege guns simply pounded the forts to bits. The Germans remained in the city until the close of the war.

Reconstruction. Restoration was rapid. The vast program of extensions and improvements in harbor works, costing \$50,000,000, which



THE AORTA

The arch of the aorta and its branches. See next page.

had been interrupted by the war, was resumed, and was rapidly completed. Trade and industry soon revived, and the tonnage of shipping reached its former high level. New streets were laid out, and a great boulevard to Brussels was constructed. Population, 300,000 (1927).

ANUBIS, a *nu' bis*, an early Egyptian deity, assistant to Osiris at the final judgment, at which time his duty was to weigh in the scale of justice the heart of the deceased, balancing it against the feather, the symbol of truth and right. The fate of the dead was determined as the scale tipped in either direction. See **OSIRIS**.

AORTA, a *or' tah*, the great artery which carries the purified blood from the heart, and through its branches distributes it to the body. As the *ascending aorta*, it rises from the left ventricle of the heart toward the top of the breastbone, and there makes a curve, called the *arch of the aorta*, whence it gives off branches to the head and arms. As the *descending aorta*, it passes downward through the chest, or thorax, and the abdominal cavity; in these parts it is also known as the *thoracic* and *abdominal aorta*. Branches are given off throughout this area, which send blood to the important abdominal viscera. It divides finally into two large trunks, whose subdivisions supply the pelvis and legs. See page 315. K. A. E.

Related Subjects. Collateral information may be found under the following headings:

Arteries	Blood	Heart	Pulse
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APACHE, a *patch' e*. See **INDIANS**, **AMERICAN** (Most Important Tribes).

APACHE STATE, a popular name applied to Arizona (which see).

APACHES OF PARIS. The Apache Indians of America were a brave, warlike people, but judged by civilized standards, they were often merciless robbers and murderers. To be taken prisoner by the Apaches meant torture and almost certain death, and in the books written by white men, the Apache was a *bad* Indian. For some reason this name was transferred to the underworld of Paris, where the thieves and cutthroats, in loosely organized bands, are proud to be known as *apaches*.

APALACHICOLA, a *latch i ko' lah*, **RIVER**, formed by the union of the Chattahoochee and Flint rivers at the southwest border of Georgia. It flows through Florida in a southerly direction for ninety miles, and enters the Gulf of Mexico through Apalachicola Bay. It is navigable throughout its course for

steamboats, and is important in the transportation of the products of the neighboring region. The town of Apalachicola is situated on the Gulf of Mexico, at the mouth of this river.

See **GEORGIA** (Rivers); **FLORIDA** (Waterways).

APE, a term often used interchangeably with monkey, but in a narrower sense applied only to the large monkeys of the Old World. The tailless Old World apes most like man in point of structure are known correctly as *anthropoid*, or *manlike*, *apes*, and are represented by the chimpanzee, gorilla, orang-utan, etc. The baboon is considered an ape, but is not an anthropoid. An anthropoid ape has practically the same organs, muscles, and nerves as man, but has longer arms, shorter legs, a square jaw, and a thicker skull, a thumbed foot which can do the work of a hand, and a spinal column which does not curve at the base. The ape's brain is much smaller than man's, though many of the gorillas and orang-utans are larger and more powerful than man. Except for the face, the palms of the hands and the soles of the feet, an ape's body is covered with coarse black or brown hair. Its diet consists largely of fruits,

and its home is built on a rude platform constructed in the trees of the tropical forests. All species of apes and monkeys are so imitative that the expression *to ape*, meaning *to imitate*, has become a part of current English speech.

M. J. H.

Related Subjects. The reader is referred in these volumes to the following articles:

Baboon	Gorilla	Orang-Utan
Chimpanzee	Mandrill	Zoology
Gibbon	Monkey	

APELLES, a *pel' eez*, the most famous painter of ancient times. No painting of his has survived, but many stories of his life and work have come down from antiquity. He lived in the fourth century B.C., and was a native of Colophon, in Ionia, a Greek colony in Asia Minor. Apelles became the close friend of Alexander the Great, and his portrait of the latter, with the thunderbolt in his hand, was celebrated. The artist used to place himself behind a picture in the public exhibitions, in order to hear the criticisms of the common



Photo: U & U

HE SHOWS THE IMITATIVE QUALITY

This simian picture was photographed in California, while a game of roque was in progress.

people. His pictures were simple and natural, and his coloring delicate and beautiful. Lucian, a Greek writer of the second century A.D., wrote a description of the paintings of Apelles that inspired many later artists. See PAINTING.

APENNINES, *ap' e nynz*, the mountain range that forms the "backbone" of Italy. It extends from the head of the Gulf of Genoa to the toe of the "boot," and covers about two-thirds of the area of the peninsula. The central division extends to the coast of the Adriatic Sea, but on the west the mountains are separated from the Mediterranean Sea by the Apennine Forelands.

The Apennines are divided into three divisions, the Northern, the Central, and the Southern Apennines; each division includes a number of smaller mountain ranges. Vegetation covers the sides of the mountains, but their summits are bare. They are low mountains, having an average altitude of 4,000 feet. The highest peak, the Gran Sasso d'Italia, is 9,560 feet; the most noted is Vesuvius (which see). The Apennines contribute much to the scenery of Italy, and furnish beautiful marble for which the country has been noted from most ancient times. The Arno and the Tiber are celebrated rivers rising within these mountains.

APHASIA, *a fa' zhi ah*, partial or complete loss of the ability to understand or remember words. The seat of the trouble is the brain, and the exciting cause may be cerebral hemorrhage, softening or abscess of the brain, meningitis, brain tumor, or other ailments that affect certain nerve centers.

Physicians recognize the following forms of aphasia:

Amnesic aphasia, or **amnesia verbalis**, in which the patient cannot recall the words needed to express his ideas.

Ataxic aphasia, inability to speak words correctly, although he can think them.

Agraphia, inability to interpret written words or to write them.

Paraphasia, in which the patient utters wrong words to convey his ideas.

Paragraphia, in which wrong or meaningless words are written.

The nerve areas affected are two *motor* centers, one for speech and one for writing; and two *sensory* centers, one for hearing and one for seeing. The auditory and visual sense organs are not impaired, but the brain centers which complete the hearing and seeing processes are unable to interpret what is heard and seen. These forms of aphasia are often spoken of as *word-deafness* and *word-blindness*. Recovery from aphasia depends upon the success attending treatment of the cause. Re-education of the brain is sometimes necessary after the physical cause is removed. See BRAIN.

W.A.E.

Amnesia. When used without a qualifying term, *amnesia* commonly refers to a condition characterized

by loss of a system of memories, such as consciousness of one's name, family, and home. The psychologist calls this a form of *dissociation*, and explains it as a diverting of the memories to the subconscious mind (see SUBCONSCIOUS).

APHELION, *a feel' yun*, or *a fe' li on*. See APSIDES.

APHIDES, *af' i deez*, numerous species of tiny, soft-bodied, winged, or wingless insects, commonly known as *plant lice*. Their mouth parts are adapted for sucking the juices of plants; therefore aphides are often very destructive. The different kinds feed on leaves, roots, and stems. The small "green fly" found on garden and greenhouse flowers is an aphid, and so, too, is the grape phylloxera, and the corn-root louse. Various shade trees, garden vegetables, and fruits are preyed on by plant lice. Most of these insects discharge a sweet liquid from the alimentary canal, and this "honeydew" is so liked by ants that the latter sometimes pasture herds of aphides, or "ant cows," on plants, and eagerly feast on the excretion (see ANT).

Although ladybird beetles, spiders, larvae of lace-winged flies, and other creatures devour immense numbers of plant lice, the peculiar reproductive habits of the aphides prevent their extermination. Between the hatching of the eggs in the spring and the mating of males and females in the fall, there are several generations produced from unfertilized eggs hatched within the bodies of the mothers. W.J.S.

Classification. Aphides belong to the family *Aphididae* and to the order *Hemiptera* (which see). The spellings *aphid* and *aphids* are also in common use.

Related Subjects. The reader is referred in these volumes to the following articles.

Ant
Lace-Winged Flies

Ladybird
Phylloxera

APHIS, *a' fis*, **LIONS**. See LACE-WINGED FLIES.

APHRODITE, *af ro di' te*, the Greek goddess of love and beauty. She is far better known by her Roman name of Venus (which see).

APIA, *ah pe' ah*, or *ah' pe ah*, chief town in the Samoan Islands. See SAMOA.

APIACEAE, *a pi a' se e*. See UMBELLIFERAE.

APIARY, *a' pi a rie*, a place designed for keeping bees. See BEE (Bee-Keeping).

A'PIS, a sacred bull, worshiped by the ancient Egyptians and kept in the temple of Osiris at Memphis. The bull selected possessed certain very special and distinguishing features, such as a black hide with certain marks on the forehead and back and other lesser distinguishing marks. The birthday of the bull Apis was celebrated every year by the people. When he died he was embalmed and buried in a splendid sarcophagus in a special part of the temple, and his death was followed by public mourning. See EGYPT; OSIRIS.

APO, MOUNT. See PHILIPPINE ISLANDS (What the Islands Are Like).

APOCALYPSE, *a pahk' a lips*. The last book of the New Testament, the work of the Apostle John, opens with these words: "The revelation of Jesus Christ, which God gave unto him, to show unto His servants things which must shortly come to pass." In the Greek language, the word for *revelation* is *apocalypse*, from a verb meaning to *uncover*, and thus the book of prophecies came to be known as the *Apocalypse of John*. This name, while still retained in some works on theology, is changed in the English version of the Bible to the *Revelation of Saint John the Divine*. For its contents and interpretation, see REVELATION.

APOCRYPHA, *a pok' ri fah*, a term applied to various sacred books which were written after the books of the Old Testament were completed and before the beginning of the Christian dispensation. The term means *hidden*, or *concealed*. The books of the Apocrypha are not accepted as authorized books of the Bible by the Protestant churches, but they are accepted by the Roman Catholic Church. The term is specially applied to the following books, written during the two centuries preceding the birth of Christ: The first and second books of Esdras, Tobit, Judith, the latter part of the book of Esther, the Wisdom of Solomon, the Wisdom of Jesus the son of Sirach, or Ecclesiasticus, Baruch the Prophet, the Song of the Three Children, Susanna and the Elders, Bel and the Dragon, the Prayer of Manasses, and the first and second books of Maccabees. See BIBLE.

APOGEE, *ap' o jee*. See APSIDES; PERIGEE.

APOLLO, *a pol' o*, among the Greeks, the radiant god of light, driver of the chariot of the sun. He was the son of Jupiter and Leto, and the twin brother of Diana, the moon-goddess, and was the god of light and purity, at first merely in a physical sense. From this he came to be regarded as god of spiritual light, and so of political progress. He also presided over song and prophecy, inspiring whom he would with musical ability or with true prophetic fervor. Apollo was the father of Phaethon, who so disastrously drove the chariot of the sun for one day.

In general, he was a kindly deity, smiling upon all, but stories are told of him which show that he had a sterner side. Thus, when he was but five days old he killed the dreadful serpent Python, and afterward, with Diana, put to death the children of the boasting Niobe. The Cyclopes, also, felt his vengeful spirit because they had forged the thunderbolts with which Jupiter killed Aesculapius, Apollo's son. Among the ancient statues of Apollo, the most remarkable one is the *Apollo Belvedere*, in the Belvedere Gallery in the Vatican.

The Name as a Symbol. In modern times the

name *Apollo* is used to represent manly strength and good looks, and the phrase, "handsome as an Apollo," is a very common figure of speech.

Related Subjects. The reader is referred in these volumes to the following articles:

Aurora
Laurel (In Legend)

Mythology
Niobe

Phaethon
Python



APOLLO BELVEDERE, IN THE VATICAN, ROME

In sculpture did ever anybody call the Apollo a fancy piece? A masterpiece of art has in the mind a fixed place in the chain of being, as much as a plant or a crystal.—EMERSON: *Society and Solitude*.

APOLLO'NIUS OF PERGA. See AGE (Alexandrian).

APOMORPHIA, *ap o maw' fi ah*. See ANTIDOTE.

APOPLEXY, *ap' o plek sie*, a word meaning *stroke*, is applied to a condition of unconsciousness and paralysis resulting from disturbance of the circulation of blood in certain parts of the brain. The most frequent cause is a break in the wall of a blood vessel, causing a hemorrhage into certain brain centers. Another term for this condition is *cerebral hemorrhage*. In these cases, two conditions always precede the stroke; one is disease of the wall of the blood vessel, and the other is high blood pressure.

A second cause is the formation of a clot, or thrombus, in one of the blood vessels of the brain. This is called *thrombosis*; this disease of the blood-vessel wall precedes the formation of the clot. A third form is due to the location

of a clot or other solid particle in one artery of the brain. The usual location of the primary clot is on the lining of the heart; a piece of this clot breaking off and being swept by the blood stream to find a new location is called an *embolus*.

Apoplexy due to cerebral hemorrhage occurs in people beyond middle life who have diseased arteries. During a period of unusually high blood pressure, a blood vessel breaks; unusual physical exertion or emotional strain may be the immediate cause. The patient may fall. Paralysis begins at once, and develops rather rapidly. It is apt to involve one side of the body—one leg, one arm, and one side of the face and tongue. The side involved is opposite to that in which the broken blood vessel is located. How greatly speech is affected depends on the location of the hemorrhage. Unconsciousness is usually complete; the pupils are unnatural; the pulse is rapid and full. In a few days fever develops, and unconsciousness and paralysis are increased. After that recovery may come about, but it is very slow. As a rule, some ability to use the leg returns first; then follows the use of the face, the tongue, and the arm, in the order named.

Apoplexy is often fatal, though complete recovery occasionally takes place. There is always a tendency toward a return. A person who has just had a stroke should be kept as quiet as possible until the physician arrives. His head should be comfortably elevated; cold applied to his head and heat to his feet are of some service. During convalescence, the paralyzed muscles must be kept in a good state of nutrition by massage and passive motion. Later on, every effort must be made to retrain the paralyzed muscles, but such efforts should not be persisted in to the point where the weak muscles are over-fatigued.

In such retraining, use ranks first in value, followed by massage and passive motion. To ward off a new stroke, the blood pressure must be kept down; violent emotions must be avoided. Great muscle strain must also be shunned. Constipation must be overcome; diet must be regulated. W.A.E

Related Subjects. The reader is referred in these volumes to the following articles:

Arteries	First Aid to the Injured
Blood Pressure	Paralysis

APOSTLE OF FREE TRADE. See COBDEN, RICHARD.

APOSTLES, *a pos' els*, the twelve Disciples chosen by Christ to preach His doctrine to the world. The story of their selection is given in the Gospels, the best account being found in *Matthew*. They were Simon Peter, and Andrew, his brother; James, and John, his brother, sons of Zebedee; Philip; Bartholomew; Thomas; Matthew; James, the son of Alphaeus, and Judas, his brother, also called Lebbeus;

Simon, the Canaanite; and Judas Iscariot. Excepting Matthew, who was a publican tax collector, all were laboring men of the most humble class. After the betrayal, Matthias was chosen by lot in place of Judas Iscariot. The Bible also gives the name of Apostle to Paul and to Barnabas.

The term Apostles is applied generally to the first Christian missionaries in all parts of the world, and to leaders in any great moral reform; as Saint Boniface, the Apostle of Germany; Saint Augustine, the Apostle of England; John Elliot, the Apostle to the Indians. Brief accounts of the twelve disciples of Christ appear in the paragraphs below:

Andrew, one of the first of Christ's Disciples, and the brother of Peter. He had been a follower of John the Baptist. Legends which tell of his preaching as far west as the Volga on the shores of the Black Sea have made him a patron saint in Russia. He is the patron saint of Scotland, also, because there is a tradition that his relics were brought to Scotland from Constantinople by supernatural power.

Bartholomew, the Apostle of whom Jesus said: "Behold an Israelite indeed, in whom there is no guile." Bartholomew is probably the same person as Nathanael, mentioned in the Gospel of Saint John as one of the first of the Disciples. Although there are many traditions concerning Bartholomew, such as his carrying the Gospel to India, little is actually known of him.

James, son of Alphaeus, sometimes identified with the character *James the Little*, who is mentioned elsewhere in the New Testament. Nothing further is known about him.

James, called THE GREATER, brother of John, who, with his brother and his father, Zebedee, was mending fishing nets when Jesus called the two brothers. They were chosen among the first four Apostles, and their names are always mentioned together in the Bible. They were among the four present at the raising to life of Jairus' daughter and among the three at the transfiguration and also at the agony in the Garden of Gethsemane. James is the first and only Apostle whose martyrdom is recorded in the New Testament; he was slain by Herod Agrippa in A.D. 44.

John, the "beloved Disciple" and companion of Jesus, and brother of James. The two had attended the preaching of John the Baptist along the Jordan, so they willingly left their work when Jesus called them, together with two other brothers, Peter and Andrew. Although both James and John were impulsive and headstrong, causing Jesus to give them the name of *Boanerges*, or *sons of thunder*, their natural defects of character were overcome and changed to elements of strength.

At the raising of Jairus' daughter, John was one of the three who were allowed to witness it, while the same three saw the transfiguration and were the ones upon whom Jesus leaned for comfort and sympathy in His hour of trial and agony in Gethsemane. John followed his Master to the Crucifixion and at the Cross Jesus commended his mother Mary to the Apostle's loving care (*John XIX, 27*). For a time after that, John returned to his old fishing trade, but, following the Pentecost, he joined Peter in active missionary work. Both were imprisoned by Jewish authorities; after being freed, they were sent to Samaria by their

fellow Apostles to aid in the work which Philip had begun. During the persecutions of the new Church in Jerusalem, John stayed there like a pillar of strength, and here Paul found him when he returned from his first missionary journey (*Galatians* II, 9). In the latter part of his life, John lived in Asia Minor, where the seven churches there established were under his care. For a time he was exiled on the island of Patmos, where he wrote the *Revelation*, probably in A.D. 95, but at the beginning of Nerva's reign he was allowed to return to Ephesus. There he died some years later, but during the latter part of his life he wrote the *Gospel of John* and the three *Epistles of John*, all four of which are included in the New Testament.

Judas Iscariot, the one of the Twelve who betrayed his Master into the hands of the Jewish priests for thirty pieces of silver, an amount equal to about \$19.50. The name *Iscariot* probably meant that he came from Kerioth, a small town in the south of Judea, while all the other Apostles were chosen from Galilee. As treasurer for the Apostles, he cared for all funds, and at the time when Mary of Bethany broke the alabaster box of precious ointment and anointed Jesus, it was Judas who objected to such extravagance and waste. Thus it seems as if he must have followed Jesus for his own personal gain, but after he had shown his Master to the chief priests by kissing him in the Garden of Gethsemane, remorse filled his soul and led him to commit suicide.

In modern usage, a treacherous person, or one who betrays another while acting as his friend, is often spoken of as a *Judas*.

Judas, mentioned as the eleventh Apostle by Luke. Nothing further is known of him; he is identified with the Lebbeus or Thaddaeus mentioned by Mark and Matthew, and with the Judas, "not Iscariot," named by John.

Matthew, accepted as the author of the first book of the New Testament, the *Gospel According to Saint Matthew*. According to his own statement, he was a tax-gatherer, and was called to be a follower of Jesus, as he sat in his place of business. Mark and Luke call him Levi, and speak of him as the son of Alphaeus, thus making him possibly the brother of another Apostle, James, the son of Alphaeus. Nothing further is recorded of him in the Gospels save that he gave a feast in honor of Jesus, to which he invited other publicans. The *Acts of the Apostles* mentions him once, and later non-Scriptural accounts declare that after preaching for some years in Jerusalem, he visited other countries as an evangelist. Most of the early legends agree that he died a natural death, but there are some which declare that he suffered martyrdom in Ethiopia, the later Abyssinia.

Peter, or **SIMON PETER**, the most prominent of the twelve Disciples of Jesus. Together with James and John, he was entrusted with his Master's most intimate confidence. He was enthusiastic in his loyalty, yet at times failed to carry out his good intentions. It was Peter who made the great confession, "Thou art the Christ, the Son of the living God," and it was also Peter who declared with oaths, on the eve of the Crucifixion, "I know not the man." Reinstated in his place of leadership by Jesus, who had seen from the beginning the real strength beneath Peter's inconstancy, he became the firebrand of the early Church (*Acts* I-XII), preaching with power, performing miracles of healing, meeting fearlessly the charges of the Sanhedrin, and enduring imprisonment with joy. Peter made a missionary journey which lasted

about eight years. He was the author of the *First Epistle of Peter*, and, according to most authorities, of the *Second Epistle of Peter*. He was probably martyred at Rome at the time of the persecution by Nero.

Philip, a man of Bethsaida, where also Andrew and Peter lived. He is recorded as having brought Nathanael to Jesus, and their names are coupled together in the lists of the Twelve. From Jesus' gentle rebuke to Philip at the Last Supper (*John* XIV, 8-9), it is gathered that though he had earnestness and zeal, he lacked deep spiritual insight. Little is known of his later life or work.

Simon, THE CANAANITE, also called *Simon the Zealot*. Aside from the fact that his name, the *Zealot*, was probably given because of his adherence to the anti-Roman party of the Zealots, little is known about him.

Thomas, commonly referred to as *Doubting Thomas*, because he was loath to believe that Christ had indeed been raised from the dead (*John* XX, 24-29). His Greek name, *Didymus*, by which he was also known, means *twin*, but there is no mention in the Scriptures of a brother, though tradition has attempted to make Thomas the twin of Christ's brother James. Matthew, Mark, and Luke tell nothing of Thomas beyond his name in the lists of Apostles, but John, in the verses above referred to, adds an account of the circumstances which won for him his name.

Of Thomas' later history, the *Acts of the Apostles* makes no mention, but tradition makes him a missionary to Parthia or, according to other accounts, to India. This later, or Indian, legend declares that he suffered martyrdom at Mount Saint Thomas, near Madras, in what is now Southeastern India, and certain churches in India which date from the early years of the Christian Era, and which have most remarkably retained their identity through all the centuries, call themselves "Thomas Christians" and claim him as their founder.

APOSTLES' CREED, a statement of Christian faith which has been traced back to about A.D. 150, so named because it is supposed to have originated with the Apostles themselves (see **APOSTLES**). It is as follows:

I believe in God the Father Almighty and in Christ Jesus His Son, who was born of Mary the Virgin, was crucified under Pontius Pilate, and buried; on the third day rose from the dead, ascended into Heaven, sitteth on the right hand of the Father, from whence He cometh to judge the quick and the dead; and in the Holy Ghost, and resurrection of the body.

The above is not exactly the form used by the churches of the present day; the original Creed has been modified, as follows:

I believe in God the Father Almighty, Maker of heaven and earth; and in Jesus Christ His only Son, our Lord; who was conceived by the Holy Ghost, born of the Virgin Mary; suffered under Pontius Pilate, was crucified, dead, and buried; He descended into Hell; the third day He rose again from the dead; He ascended into heaven, and sitteth on the right hand of God the Father Almighty; from thence He shall come to judge the quick and the dead.

I believe in the Holy Ghost; the holy Catholic Church; the Communion of Saints; the forgiveness of sins; the resurrection of the body; and the life everlasting. **AMEN**.

APOTHECARIES', *apoth'ekariz*, **WEIGHT**, the system of weights used by druggists when preparing prescriptions. The pound is divided into 12 ounces, the ounce into 8 drams, the dram into 3 scruples, and the scruple into 20 grains. In both apothecaries' and troy weight, there are 5,760 grains to the pound, 480 grains to the ounce. The avoirdupois pound contains 7,000 grains; the ounce 437½ grains. The grain, the smallest unit, is the same in all three weights above named, the difference in the size of the pound being due only to a difference in the number of grains it contains. See **DENOMINATE NUMBERS**; **POUND**.

APOTHECARY. See **DRUGGIST**.

APPALACHIAN, *ap a la' chi an*, or *ap a lach' i an*, **HIGHLAND**. See **UNITED STATES** (Size, Coast Line, Physical Features).

APPALACHIAN MOUNTAINS, the name that is applied to the great mountain system occupying the eastern part of North America and extending from the Gulf of Saint Lawrence into Alabama, a distance of over 1,300 miles. The Appalachians make up the eastern highlands of the continent, and include a number of parallel ranges, all extending in a southwesterly direction. They form the watershed separating the rivers that flow into the Atlantic from those flowing into the Gulf of Mexico (see **DIVIDE**).

Description. In general, the Appalachians are low mountains, with rounded summits and even crests, or ridges. With few exceptions, their sides are clothed with forests. Between the ranges are many highly fertile and densely populated valleys, and the foothills and uplands support a large agricultural population. In these mountains are a number of deep, narrow valleys with almost perpendicular sides, through which rivers wend their way to the sea; the most noted of these valleys are *Crawford Notch* in the White Mountains, the *Highlands* of the Hudson, *Delaware Water Gap*, and *Shenandoah Valley*. The highest peaks are Mount Washington in New Hampshire (6,293 feet) and Mount Guyot in North Carolina (7,025 feet). Lake Champlain is the only lake of importance in the system.

Minerals and Water Power. These mountains contain iron ore, coal, fire clay, marble, gypsum, and salt, and extensive oil fields occur in many of the valleys. Many rapid streams flow down their eastern slopes, and where the foothills descend to the low coastal plain there are hundreds of excellent sites for water power. Along this line we find many manufacturing cities (see **FALL LINE**).

Related Subjects. For the products of the Appalachian system, see the articles describing the regions through which they pass. See, also:

Adirondack Mountains
Allegheny Mountains
Black Mountains

Blue Ridge Mountains
Cumberland Mountains
Green Mountains

APPEAL, *ap peel'*, in law, the removal of a suit from a lower to a higher court for the purpose of securing a reversal or modification of the decision of the lower court. Each system of courts has particular rules upon which appeals may be granted, usually requiring the presentation of additional material evidence, or the certification of an error in the conduct of the trial by the court. An appeal makes it possible for the higher court to reconsider the facts of the case, to reverse the decision, or in some cases to remand it to the lower court for a new trial. See **PROCEDURE**.

APPENDICITIS, *ap pen di si' tis*, inflammation of the vermiform appendix, due to infection by some one of the pus bacteria. The inflamed suppurating appendix may rupture, causing a more or less generalized peritonitis, or the pus may be walled off, causing an appendicial abscess.

The appendix is a small tube sealed at one end and attached to the caecum, or head of the large bowel, at the other. It opens into the large bowel near the point where the small intestine joins the large; as a rule, it lies rather deep in the right side of the abdomen, well below the level of the navel and near the flank. But the intestines are so loosely attached that the appendix is sometimes found in other regions of the abdomen. This tube is generally about three to four inches long, and slightly larger than a lead pencil.

An attack of appendicitis generally begins with a colicky pain, which seems to start in the lower right side of the abdomen; the pain is colicky rather than continuous. Nausea may follow. Later the pain becomes steady; soreness most marked over the appendix region is present. The abdominal muscles are held firm. Fever develops. Examination of the blood shows a leucocytosis, or increase in the number of white blood corpuscles.

Treatment. It is important that a purgative, such as a dose of castor oil, should not be given at the onset of an attack of appendicitis, or at any time during its active continuance; to do so increases the danger of rupture and generalized appendicitis. Therefore, in any bowel disorder in which appendicitis is



LOCATION OF VERMIFORM APPENDIX

Arrow at *a* points to appendix. It is at the right of the exit from the small intestine and at the base of the large ascending colon (see **INTESTINE**).

suspected, purgatives should not be given.

The sick person should lie quietly in bed, with an ice bag over the sore region in the abdomen. No food should be eaten. The diagnosis should be made as quickly as possible; it is just as important that a decision on the question of operation should also be prompt. In some instances, dieting, rest, and the local application of cold is the only treatment required.

Appendicitis may be chronic. As a rule, attacks are repeated. W.A.E.

APPERCEPTION, *ap' er sep' shun*. When we see a new object, when we hear a new fact, when we read a new idea—in fact, when we meet with any new kind of experience—the mind refers it to the store of knowledge already possessed. It compares this new experience with the old, tries to explain it and to assimilate it by interpreting it in the light of previous experiences. This mental process is known in the science of psychology as *apperception*. If an idea is closely related to something already well understood, the effort of apperception is so slight that we scarcely recognize it, or we may be entirely unconscious of it; but if the experience is new and important, all ideas which relate to it are brought into consciousness and applied to the new object or phenomenon.

Before a new experience can be apperceived, we must obtain data concerning it. If it is a new sort of fruit, we bring to bear upon it the senses, such as sight, touch, taste, smell. We then attempt to learn of its manner of growth, whether the plant is annual, biennial, or perennial; whether it is an herb, shrub, or tree and whether it thrives in a warm or temperate climate. When these items of information are obtained, we are prepared to classify properly the new specimen and add it to our idea of fruit.

Its Value in Education. The proper understanding of the processes of apperception is very important in the formulation and application of sound methods of teaching. For in this connection it is well to remember the following important facts:

(a) The mind in mastering any new idea does it by going from what is known to the nearest related unknown. If a new kind of fruit is presented to the child, his first act is to discover its known qualities. It follows therefore that in teaching new subjects one has to take into consideration the knowledge the child already possesses. Each bit of information or new knowledge must be so presented as to show the relation that exists between it and the facts already known and the relation of each of them as a whole. Only knowledge presented in such a way is of value because it can be thoroughly assimilated and combined with previous knowledge.

(b) When ideas are presented, the memory of past similar ideas will exert a modifying influence, and the tendency is to interpret the new idea by the old ideas which first come into consciousness. Every one

interprets new ideas in the light of his special experience. The artist sees in a landscape material for a beautiful picture, while the farmer sees in the same landscape merely so much fertile soil suitable for cultivation. C.E.S.

Related Subjects. See ASSOCIATION, LAWS OF; INTEREST; PERCEPTION; PSYCHOLOGY.

APPETITE, *ap' e tite*. This word, which in Latin means *desire* in general, is in English most commonly used to mean desire for food and drink. Strictly speaking, appetite refers to an agreeable feeling of anticipation for one's meals and to the zest with which food is eaten, while hunger has its origin in the demand of the body for nourishment. Hunger can be appeased by injections of food into the rectum or by artificial distension of the stomach. When the body fails to register the sensation we call hunger, there is reason to suppose that the health is not normal.

On the other hand, sometimes hunger remains, although large amounts of food are eaten. This condition indicates that something is wrong with the body's ability to assimilate the food eaten. This is the case in conditions such as Grave's disease and diabetes. Usually, then, it is an empty stomach which gives the sensation of hunger, but when the condition becomes more severe, it is actually the starving cells of the body that are crying for nourishment.

The amount of food one eats is usually dependent on the appetite, and it is a wise habit to eat slowly, to give the appetite a chance to become satisfied before too much has been eaten. Physicians hold that most people who are not engaged in hard manual labor stimulate their appetites artificially, and as a result they overload the stomach and reduce their efficiency. See FOOD. K.A.E.

APPIAN, *ap' i an*, **WAY**, called the Queen of Roads, a famous highway of ancient times, named for the Roman censor Appius Claudius, who began its construction in 312 B.C. Leading directly from the gates of Rome to Capua, in Campania, it was afterward extended to Beneventum, Tarentum, and thence to Brundisium, on the southeast coast of Italy. This broad, historic highway, the *Via Appia* that the Latin student so often comes upon in his reading, was paved with huge blocks of lava, laid on a bed of broken stone cemented with lime, and it formed the chief thoroughfare for travelers from points east and south of Rome. Portions of the road are yet in use, although new top dressings have been frequently applied, and there still may be seen the ruins of many of the magnificent tombs that were built along its sides in the vicinity of Rome. See ROADS AND STREETS. (See present-day illustration, on next page.)

AP'PIUS CLAUDIUS. See APPIAN WAY, above.



Photo: U & U

The Queen of Roads. Countless tourists who have visited Italy will recognize the Appian Way in this illustration. It has been repaved repeatedly during the past two thousand years, yet in at least one place the original stones may be seen.



APPLE, the most profitable fruit of the temperate regions, and according to many authorities, the most valuable in all the world. It is also the commonest and one of the oldest known; references to it are frequent in the literature of all countries and all ages. Popularly, it is identified with the "fruit of the tree of knowledge" eaten by Adam and Eve in Eden—

* * * * * whose mortal taste
Brought death into the world, and all our woe,
With loss of Eden;

and the Greeks also made an apple, the famous Apple of Discord, the cause of a great disaster. In general, however, it has received more favorable notice, for poets have loved to sing not only of the "apple blossoms white" which "hung in rich profusion," but of the "alluring fruit" as well. Bryant's *Planting of the Apple Tree* is a much-loved poem which sings of the beauties and uses of the tree itself.

The name is used, in combination, for various fruits which are not at all related to the apple. Rather startling, at first, seems Whittier's—

Let other lands, exulting,
glean
The apple from the pine,

until there comes the realization that what is meant is the pineapple, which is not an apple at all. The tomato was long known as a "love apple," and the "apple of Sodom" had an unenviable reputation which still persists. Just what this fruit was is not known, but ancient travelers in the East told of a beautiful, luscious-looking fruit, tempting to the sight, but dust and ashes to the taste.

Related to the Rose. Like the peach, the cherry, the strawberry, and the plum, the apple belongs to the rose family, and its exquisite blossoms, white or pink-tinted, are much like the first of the roses, the wild rose. The smooth-skinned, juicy fruit, with its hard pulp and its core containing the horny seed cells, is too well known to need description. Authorities tell of at least two thousand varieties, which differ in color, in shape, and in taste; but all these have been developed from two species—the common apple and the wild crab apple (see CRAB APPLE).

Beginnings of Apple Culture. The development has been slow, for remains of prehistoric civilization show that even in those far-distant times the apple was cultivated. The Romans knew and prized it, and probably introduced it into England. One of the early governors of Massachusetts Bay Colony performed a signal service to his newly adopted country by introducing the apple in 1620; for North America, now the greatest apple-producing region in the world, had no native apples. As the colonists in the years that followed pushed their way westward, they planted apple orchards everywhere; and a certain eccentric character earned fame and the name of Johnny Appleseed by traveling over Western Pennsylvania and Ohio scattering apple seeds. Wherever he came upon a fertile, well-watered spot, there he planted his seed, and the little orchards which sprang up he tended on his later visits. Fantastic as



BELONGS TO THE ROSE FAMILY
Above is a picture of the wild rose; below is an apple blossom.

were his methods, certain parts of Ohio look upon him as a benefactor.

Where Apples Are Grown. No fruit in the world is more widespread than the apple, and no other can be successfully grown so far north, for its blossoms appear late in the



The apple blossoms' shower of pearl,
Though blent with rosier hue,

As beautiful as woman's blush,
As evanescent, too.

—L. L. LONDON: *Apple Blossoms*.

spring, and thus escape the frosts. Europe grows apples as far north as Scandinavia, and the temperate regions of the southern hemisphere have been found to be well adapted to their production, but North America, as stated above, is the real home of the apple.

United States. With an annual crop of over 100,000,000 bushels, and in some years with a yield of over 200,000,000 bushels, the United States is the greatest apple-growing country in the world. Of late years, the Northwestern and Western states have made enormous strides in the industry, and Washington is now the first apple state, having overtaken and passed New York. Michigan, often, though not always, ranks third, and other important states are Pennsylvania, Virginia, Illinois, California, Oregon, Idaho, Ohio, Missouri, and Arkansas. Their order varies. The proportion of apples harvested to the number of trees is comparatively low in the Western states, for many of the orchards there are young, and some varieties do not produce fruit until they are ten years old. The Western apples are of a beautiful rich color, so dark at times as to look almost black. The finest are raised in irrigated regions, and they are as

carefully harvested, graded, and packed as are oranges.

Canada. In Canada the apple is rapidly becoming the chief fruit. Ontario leads in apple production, its orchards yielding more than half of the crop of the Dominion. A considerable part of the Ontario apples is sent to the Western provinces, though some of these, especially British Columbia, are developing a rapidly increasing industry of their own.

Methods of Growth and Care. Apple seeds, if planted in the proper soil, will grow and produce apples, but the fruit will not be the same kind as that from which the seed was taken, and will, moreover, be decidedly inferior. Good varieties of apples, therefore, are usually secured by grafting, and by far the larger part of this is done in nurseries. The plants to be grafted upon are raised from seed, but the buds to be grafted are taken from a tree that is known to produce excellent fruit of the variety desired. No matter of what kind the seedling is, if a Northern Spy bud be grafted upon it the full-grown tree will produce Northern Spies; if the bud be from a Maiden Blush tree, Maiden Blush apples will develop. A farmer wishing to start an orchard buys from

a nurseryman trees which are one, two, or more years old. These, if properly cared for, will live and produce for a long time, an orchard thirty years old frequently being still in fine bearing condition.

The old unkempt orchards with their spreading, gnarly-limbed trees, thick with blossoms in the spring and shining with their oval, bright-green leaves, are most picturesque, but it is the carefully tended orchard that produces the best yield. The trees should be planted in rows from thirty to forty feet apart each way, that the full-grown branches may not interfere with one another. Careful pruning is an important factor, but one about which no specific directions can be given, as it differs according to the variety of apple and the locality. In general, the trees should not be allowed to attain a greater height than twenty-five feet, and the tops should be rounded and spreading.

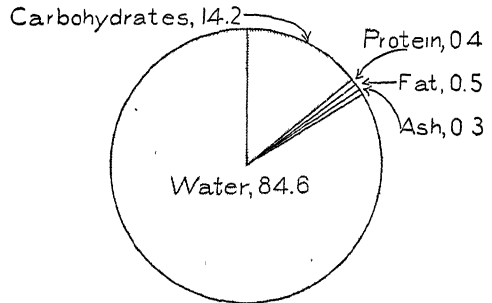
All about the roots of the trees the soil should be carefully cultivated until about the middle of July, but then tillage should cease. No attempt should be made except on richest soil to raise regular crops on orchard land, or to graze animals there, but it is well, at the time cultivation is abandoned, to plant clover, cowpeas, alfalfa, or some such crop, and plow these under in the spring, in order to supply the soil with plant fiber and humus.

Kinds. Of the very numerous varieties of apples produced in North America, not more than one hundred are really profitable, and usually not over twenty varieties are successful in any one region. The kinds which do well in Canada and the northern part of the United States usually do not thrive in Missouri and Southern Illinois, and those which yield plentifully in Virginia seem ill adapted to the irrigated Western lands. Whenever apple culture is begun in a new locality, trials have to be made to determine which varieties best suit the peculiar soil conditions of the region. In general, the warmer apple-growing regions succeed best with the early fruit, while the colder regions produce the best late fruit, or winter apples. The larger number of apples in the market to-day are of this latter variety—that is, they are left on the trees as long as there is no danger of their being frozen. They do not, like the softer peaches and plums, rot on the trees.

It is impossible to mention all or even many of the common varieties of apples, but a few of the favorites are the Northern Spy, the Pippin, the Russet, the Jonathan, the Spitzenberg, the Winesap, the Bellflower, the Snow Apple, the Baldwin, the Greening, the Duchess, and the Maiden Blush. The two last named are tart summer apples, not as good as some others for eating. The Ben Davis is raised in great quantities, because it is easy of culti-

vation and keeps well, but it is not considered to be the best variety either for eating raw or for cooking.

Uses and Food Value. Since winter apples may be kept in cold storage, or even in cool, dry cellars until the earliest summer apples are on the market, it is possible to have apples



COMPOSITION OF THE APPLE

The figures show the percentage each ingredient bears to the whole. See FOOD (Chemistry of Food). The fuel value is 285 calories per pound.

the entire year. And no fruit is more generally welcome. The choicest apples are for the most part eaten raw, but the housewife finds almost innumerable uses for them in cookery, delicious jelly, sauces, pies, puddings, and dumplings being produced from them. The inferior grades are either canned or dried before being placed on the market, or are made into cider, from which in turn the best vinegar is made.

Apples are among the most wholesome of fruits—a fact that is recognized in the old rhyme—

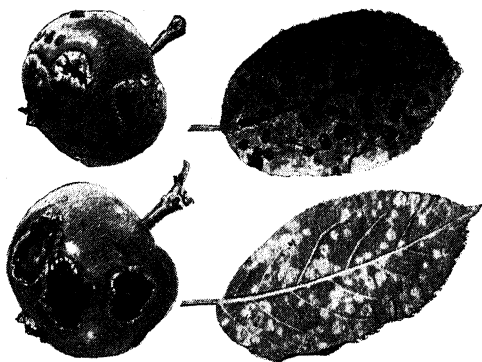
An apple a day
Keeps the doctor away.

This does not mean that they have high nutritive value, for like most fresh fruits, they are largely water. To replace one egg in food value, fully two and one-half pounds of apples would be needed. The water which they contain, however, and the vegetable acid make them excellent regulators of the system. Dried or evaporated apples, like most dried fruits, have a higher nutritive value than fresh, but they have not the refreshing, tonic qualities.

Seedless Apples. Two horticulturists, John F. Spencer of Grand Junction, Colo., and Luther Burbank, worked successfully to produce an apple in which there is no core. The seedless apples are firm, juicy, and of good color, and lack entirely the horny receptacles that surround the seeds in ordinary apples. The tree is blossomless, having only stamens and a small quantity of pollen, but it is free from the worst pest of apples, the codling moth (which see).

Diseases of Apple Trees. *Apple rust* and *apple scab* are two of the most troublesome

diseases to which apples are subject. The former is caused by a fungus which appears as yellow spots on the leaves and also attacks the little apples in May and June, and the only safe



APPLE SCAB

Appearance of diseased fruit and leaves.

method of prevention is a thorough spraying of the trees with Bordeaux mixture as soon as the leaves appear.

Cedar trees should not be allowed to exist in the neighborhood of apple orchards, for the rust fungus develops on the cedars.

Apple scab, the result of another fungus, produces dark spots on leaves, flowers, and fruit, the growing apples often becoming ill-shaped and cracked. This is the most serious of the apple diseases, and the most widespread in its scope, appearing everywhere in apple regions. Bordeaux mixture is the remedy for this, too, but one spraying is not sufficient. Beginning at the season when the flower buds are swelling, there should be three applications, at intervals of ten days. If these can be given in rainy weather, results are better, for it is the dampness which destroys the fungus.

Insect Pests. The codling moth, referred to above, is the most destructive enemy of the apple, but the apple-tree borer is a close second. There are two kinds of beetle grubs that go by this name—a round-headed borer and a flat-headed borer, and the former is the greater pest. If the beetles can be prevented from laying their eggs on the bark, the danger is prevented, for the grubs do not themselves seek out the trees. Painting the lower part of the tree during the egg-laying months of June and July with whitewash or with fish-oil soap is usually effective. No spraying can rid trees of the borers, once they have been hatched; they must be dug out patiently one by one. B.M.D.

Classification. The apple belongs to the family *Rosaceae*. Cultivated varieties are derived largely from *Pyrus malus*.

Related Subjects. The reader is referred in these volumes to the following articles:

Apple Maggot
Apple of Discord
Burbank, Luther

Grafting
Insecticides and Fungicides
Rose

APPLE BUTTER. See CIDER.

APPLEJACK. See CIDER.

APPLE MAGGOT, often called **RAILROAD WORM**, has long been known in New England as an apple pest, and the insect is known to occur as far west as Minnesota. It is widely distributed, but for some reason is most injurious in Northern New York and New England. The maggots burrow through the flesh of the apple, leaving discolored streaks, often so numerous that the pulp breaks down. The injury is confined to sweet and subacid varieties of fall apples. The fruit in home orchards is frequently ruined.

The adult of the apple maggot is a fly, slightly smaller than the house fly, with wings marked with four black bands. The flies emerge during July, and the females at once commence depositing their eggs in the fruit. The egg is placed just under the skin, often twelve to fifteen to a single apple. The eggs hatch in four to five days, and the larvae begin feeding on the fruit. Four to six weeks are required for the larval stage. When mature, the larva usually leaves the fruit and enters the soil to pupate. The insect remains in the soil during the winter.

Destruction of the infested fruit and orchard cultivation are the best means of preventing injury. Allowing hogs or chickens to run in the orchard will reduce the number of larvae. Spraying the trees with arsenate of lead, as for the codling moth, will reduce the number of flies.

The *cherry fruit-fly* is a close relative of the apple maggot, with very similar life history and habits. Sour and subacid varieties are most injured. The measures suggested for the apple maggot are effective for this insect. Applications of arsenate of lead, one pound to fifty gallons, are effective. The first application of the spray is made during the first ten days of June, a few days before the cherries begin to redden. W.J.S.

Scientific Names. The scientific name of the Mediterranean fruit-fly is *Ceratitis capitata*; of the apple maggot, *Rhagoletis pomonella*; of the cherry fruit-fly, *R. cingulata*.



BLISTER CANKER

On the trunk of an apple tree. The bark at the edge of the canker has been cut away, to show the extent of the diseased area.

OUTLINE AND QUESTIONS ON THE APPLE

Outline

I. Plant Family

- (1) The most important fruit of the rose family
- (2) Blossoms
- (3) The crab apple and common apple

II. Apple Culture

- (1) Cultivated by earliest historic peoples
- (2) Popularly known as the fruit of the Garden of Eden
- (3) Prized by Greeks and Romans
- (4) Widely cultivated throughout Europe as far north as Scandinavia
- (5) Introduction into the United States
- (6) Growth of apple culture in the United States
- (7) Cultivation in Canada

III. Methods of Cultivation

- (1) Grafting
- (2) The planting of trees
- (3) Pruning

- (4) Cultivation of the soil
- (5) Other crops in orchard
- (6) Seedless apples

IV. Varieties

- (1) Differ in various localities
- (2) Common varieties

V. Diseases and Pests of Apple Trees

- (1) Apple rust
- (2) Apple scab
- (3) The codling moth
- (4) The round-headed borer
- (5) The flat-headed borer
- (6) Means of prevention

VI. Uses and Food Value

- (1) Eaten raw
- (2) Cooked in various ways
- (3) Dried
- (4) Canned
- (5) Cider and vinegar
- (6) Wholesomeness

Questions

What are some of the diseases to which apples are subject?

What relatives of the apple appear on our tables?

Which would you rather have, all the apple orchards in the world or all the orange groves? Why?

If you save the seeds from your choicest Jonathan apples and plant them, will you in time have an orchard of Jonathan apples?

Why can apples be grown farther north than any other kind of fruit?

What is a "love apple"?

If you went into an orchard early in June and saw the ground heavily carpeted with alfalfa, would you think the farmer knew his business?

Who was Johnny Appleseed?

Why are the trunks of apple trees sometimes whitewashed?

If you had an apple tree that produced very satisfactory fruit and wanted others like it, how would you go about securing the same kind?

What has the apple to recommend it as a food besides its flavor?

Is an orchard in which seedless apples are produced as beautiful in the spring as an ordinary orchard? Why?

What are the peculiar advantages of the seedless variety?

What drink is made from apples?

Describe briefly the process of manufacture.

Which province of Canada produces the largest apple crop? Which state of the American Union?

Were apples native to the continent which is now foremost in their production?

What part did the apple play in the legends of the Hebrews and in those of the Greeks?

APPLE OF DISCORD, the wonderful golden apple, in the tales of mythology, destined to be the real cause of the Trojan War (which see). The story appears in the article **ERIS**. See, also, **PARIS** (legend).

APPLE OF SODOM, *sah' dahm*. See **SODOM**, **APPLE OF**.

APPLE RUST; **APPLE SCAB**. See **APPLE**, for these diseases.

APPLETON, WIS. See **WISCONSIN** (back of map).

APPRAISAL, *ap prayz' al*, a formal determination of property values. Frequently, in the course of legal proceedings, an impartial valuation of property is necessary; the court appoints persons (not necessarily technical experts) as *appraisers*, who estimate the value of the property and make a formal report. This may be necessary in a variety of cases; for example, when a personal estate is to be distributed; when merchandise must be evaluated for customs duty; when, by the right of eminent domain (which see), private property is to be condemned for public use; in bankruptcy proceedings, and many other legal cases. In the matter of customs collections, the President of the United States appoints general appraisers of customs in collection districts, or in the absence of such appointment, the collector of the district may name persons as appraisers.

Aside from law courts, the process of appraisal is necessary in an increasing degree in modern business. The field of property insurance is one in which the exact valuation of property is of the utmost importance. The income-tax system makes it necessary for corporations to have exact records of their physical property; such a record is of value in the conduct of their business, as well. Administration problems relating to plant operation, to mergers, to receiverships, etc., require the assistance of accurate appraisals. The work of an appraiser differs from that of an accountant in the fact that the latter deals with the book records of a company, while the appraiser's work is that of evaluating the current physical property.

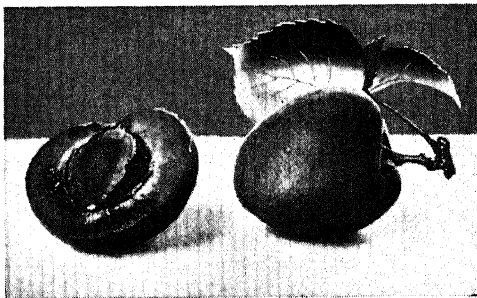
Various bodies, particularly such organizations as local real-estate boards, have authorized appraisers, who work for a set fee. The necessity of increasingly detailed appraisements has developed the profession of "appraisal engineer," and has led to the organization of business firms who devote themselves and their technical experts to the specialized task of business appraisals. Banks employ experts to report on the physical properties of those who apply to them for loans. All such companies or individuals make complete surveys of the property of a corporation or organization, including every item, its original cost, its depreciation, its

value in terms of current purchasing rates, the present insurance and insurable values, and other assets or liabilities which help in determining total values. Many large companies have included a periodic appraisal of their property values as a part of their business policy.

J.J.T.

APPRENTICE, *ap ren' tis*. When Benjamin Franklin was a boy, his father made an agreement with Benjamin's older brother that the latter should take the lad, give him a home, and teach him the printer's trade. In agreements like this one, which were common in Franklin's time, the boys were *apprenticed* to men who in law were known as *masters*. By the terms of an apprenticeship arrangement, the master furnished the apprentice with a home and taught him the trade in which the master was engaged. The apprentice was to obey the master and to give him his services as long as the agreement lasted. A person under age, that is, a minor, might of his own accord agree to become an apprentice, but his parents or guardian had to consent to the agreement. The time for which the agreement was made depended to some extent upon the trade to be learned; seven years was the maximum. Formerly, nearly all trades were learned in this way, but the introduction of machinery set aside this method of learning trades. See **VOCATIONAL EDUCATION** (Apprenticeship).

APRICOT, *a' pri kot*, or *ap' ri kot*, one of the fruits containing stony seeds, grown on a tree belonging to the same family as the rose,



THE APRICOT

and cultivated in all mild regions. Because it blossoms early, the tree cannot be grown with profit in climates where spring frosts are prevalent. The apricot is native to Eastern Asia. It was introduced into Europe in the fourth century B.C., and made its way into North America centuries later, by way of Europe. Over ninety-five per cent of the commercial yield of the United States is produced in California, where apricots are a very profitable crop; Arizona is second, with about one-tenth as large a crop.

The fruit is intermediate between the peach and the plum, is much like the former in gen-

eral appearance, but is smaller and has a smoother skin. The flesh is a rich-yellow color, and has a delicate flavor which some persons prefer to that of the peach. Dried apricots, which are marketed in great quantities, are more pronounced in flavor and have a higher food value, since the nutriment is found in them in more concentrated form.

The apricot tree resembles the plum tree in foliage and the peach tree in bark. It is very beautiful in spring, when its flowers form masses of delicate pink, and even more so when the golden fruits, in a setting of dark-green foliage, weigh down the branches. The trees

are propagated on apricot, plum, and peach roots, and numerous varieties have been developed. In the orchard the plants stand twenty to twenty-five feet apart each way. Cultivation of the orchard soil, planting of cover crops, and heavy annual pruning are standard practices in apricot culture. The fruits are harvested by hand; those for drying are cut in half, pitted, and exposed to the sun's rays. A French liqueur is made from the kernels. B.M.D.

Scientific Name. The apricot, like the apple, belongs to the family *Rosaceae*. Its botanical name is *Prunus armeniaca*.



APRIL, one of the loveliest months of the year, has a name that is especially fitting, for it comes from a Latin word meaning *to open*. It is the time of opening buds. Some learned scholars declare that the Romans did not name their months in this poetic manner; but those who defend the theory are just as learned, and the beautiful idea may be given the benefit of the doubt. The special flower of April is the daisy, and its gem is the diamond.

April's Place in the Year. April is the fourth month in the year. Originally, in the time of the Romans, it had but twenty-nine days, but when the calendar was revised in the time of Caesar, it was found that there were ten extra days to be distributed among the months, and of these April received one (see *CALENDAR*). It is thus one of the thirty-day months, and so crowded is it with nature's activity that no other month in the year makes a greater change in the appearance of the out-of-door world. At the beginning of April in northern climes, snow is often lingering in the hollows, and frequently a sharp frost comes and binds fast the little brooks that have begun to be free from winter's shackles. But April's sun is warm and bright, and no frost and snow can long hold out against it.

It is a season of new life everywhere. Grass grows freshly green; trees and shrubs that have seemed dry and dead put out tiny leaves, and little twigs can no longer be snapped off sharply, for the sap is flowing in them and they have acquired a new strength and a new resistance. Early wild flowers push their way through the grass of the meadow or the thick forest carpet of last year's dead leaves, and on

lawns and in gardens the crocuses and snowdrops appear. The birds have set out on their northward journey, and almost all things which make summer delightful are putting in an appearance.

This transition month is specially known for its changing weather. Occasionally there are days so cold that they seem to have been left behind by winter, or days so hot that they are advance-couriers of summer; but the most distinctive feature of April is its showers. Changes from flashing sunlight to pouring rain are frequent, and William Watson's lines—

April, April,
Laugh thy golden laughter,
But, the moment after,
Weep thy golden tears!

give us as good a picture of the month as can be expressed in words.

April has played a curious part in United States history, for nearly every war in which the country has been involved has begun in this month—the Revolution, the Mexican War, the War of Secession, the Spanish-American War, and the World War. This last war did not begin in that month, but in April the United States entered it.

Special Days. April has several special days. The first day is April Fools' Day, or All Fools' Day (which see); it is not a holiday, but a time to which children look forward by reason of the sanction it gives to mischievous pranks. Almost always Easter falls in April, and fittingly, too, for it is the symbol of that broader new life of which April represents one phase. Many states in the American Union

APRIL CALENDAR

Birthdays

- | | |
|--------------------------------------|--|
| 1. Prince von Bismarck, 1815. | 18. George H. Lewes, 1817. |
| 2. Hans Christian Andersen, 1805. | 19. Roger Sherman, 1721. |
| 3. Washington Irving, 1783. | 20. Sir John Eliot, 1592. |
| 5. Algernon Charles Swinburne, 1837. | 21. Friedrich Froebel, 1782. |
| 6. Elihu Yale, 1649. | 22. Henry Fielding, 1707. |
| 7. William Wordsworth, 1770. | 23. William Shakespeare, 1564 (uncertain). |
| 10. William Hazlitt, 1778. | James Buchanan, 1791. |
| 11. George Canning, 1870. | Stephen A. Douglas, 1815. |
| 12. Henry Clay, 1777. | 24. Anthony Trollope, 1815. |
| 13. Thomas Jefferson, 1743. | 25. Oliver Cromwell, 1599. |
| 15. Bliss Carman, 1861. | 26. Alice Cary, 1820. |
| 16. Charles W. Peale, 1741. | 27. U. S. Grant, 1822. |
| 17. J. Pierpont Morgan, 1837. | 28. James Monroe, 1758. |

Events

1. Construction of first railroad in United States begun, 1826.
Four provinces of British India officially reconstituted, 1912.
2. United States mint established, 1792.
Richmond, Va., evacuated by Confederates, 1865.
3. Bismarck resigned his office, 1877.
4. Henry Hudson sailed on third voyage, 1609.
United States flag adopted by Congress, 1818.
5. British Museum originated, 1753.
6. Washington elected President of United States, 1789.
United States entered war against Germany, 1917.
7. Canada defeated reciprocity with United States, 1888.
8. Legislature of British Columbia passed anti-Japanese immigration law, 1905.
Louisiana admitted to the Union, 1812.
9. Charleston, S. C., captured by British, 1780.
10. Napoleon abdicated French throne, 1814.
Huge fire in Toronto, Canada, 1904.
11. William and Mary crowned in London, 1689.
Hudson Bay, Newfoundland, and Nova Scotia, surrendered to England, 1713.
12. Union Jack made English national flag, 1606.
13. Edict of Nantes signed by Henry IV of France, 1598.
14. First anti-slavery society in United States, formed by Quakers, 1775.
President Lincoln shot by J. Wilkes Booth, 1865.
15. *Titanic* sank, and about 1,600 persons were drowned, 1912.
16. First railroad in India opened, 1853.
18. Paul Revere made his famous ride, 1775.
Earthquake and fire in San Francisco, 1906.
19. Battle of Lexington, 1775.
20. Bacon's Rebellion began, 1676.
21. Canada forbade seal-catching in certain areas, 1894.
Spanish-American War began, 1898.
22. Contract signed for transfer of Panama Canal to the United States, 1904.
24. Russia began war against Turkey, 1877.
Battle of Fish Creek, Canada, 1885.
25. Japan opened Yeddo and other ports to trade, 1867.
Allied forces landed on both sides of the Dardanelles, 1915.
26. Great plague in London began, 1665.
Hull, Canada, nearly destroyed by fire, 1900.
28. Napoleon exiled to Elba, 1814.
30. George Washington inaugurated as President of the United States, 1789.
Louisiana Purchase made, 1803.

For Study

- | | | |
|-------------------------|--------------------|----------------|
| 1. Arbor Day. | 6. Bluebird. | 11. Crocus. |
| 2. Arbutus. | 7. Bulbs. | 12. Daffodil. |
| 3. Audubon, John James. | 8. Clouds. | 13. Dandelion. |
| 4. Bird Day. | 9. Cocoon. | 14. Earthworm. |
| 5. Bird Houses. | 10. Corn Planting. | 15. Easter. |

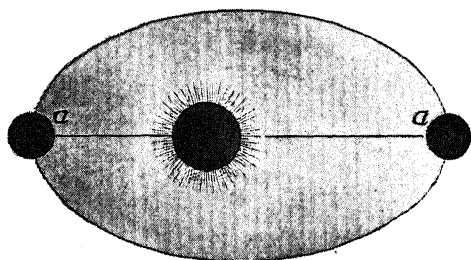
QUOTATIONS FOR APRIL

1. The first of April, some do say,
Is set apart for All Fools' day;
But why the people call it so
Nor I, nor they themselves, do know.
— *Poor Robin's Almanac*
2. April cold with dropping rain
Willows and lilacs brings again,
The whistle of returning birds
And trumpet-lowing of the herds.
— *Emerson.*
3. Dare to be true; nothing can need a lie;
A fault which needs it most, grows two thereby.
— *Herbert.*
4. April is here!
Listen, a bluebird is caroling near!
Low and sweet is the song he sings,
As he sits in the sunshine with folded wings.
— *Rexford.*
5. If a task is once begun,
Never leave it till it's done;
Be the labor great or small,
Do it well, or not at all.
— *Phoebe Cary.*
6. I have found violets, April hath come on,
And the cool winds feel softer, and the rain
Falls in the beaded drops of summer time.
— *Willis.*
7. I wandered lonely as a cloud
That floats on high o'er vales and hills,
When all at once I saw a crowd,
A host of golden daffodils.
— *Wordsworth.*
8. Gladness is born of the April weather,
And the heart is as light as a wind-tossed
feather.
— *Rexford.*
9. Now the bright crocus flames, and now
The slim narcissus takes the rain,
And, straying o'er the mountain's brow,
The daffodillies bud again.
— *Long.*
10. Let us then be up and doing,
With a heart for any fate;
Still achieving, still pursuing,
Learn to labor and to wait.
— *Longfellow.*
11. A gush of bird song, a patter of dew,
A cloud and a rainbow's warning,
Suddenly sunshine and perfect blue—
An April day in the morning.
— *Spofford.*
12. I would rather be right than be President.
— *Clay.*
13. The God who gave us life, gave us liberty at
the same time.
— *Jefferson.*
14. Every tear is answered by a blossom,
Every sigh with songs and laughter blent;
Apple-blooms upon the breezes toss them
April knows her own and is content.
— *Coolidge.*
15. He who feeds men, serveth few;
He serves all, who dares be true.
— *Emerson.*
16. Sweet April showers
Do bring May flowers.
— *Tusser.*
17. Truth crushed to earth shall rise again;
The eternal years of God are hers.
— *Bryant.*
18. April's coming up the hill!
All the spring is in her train,
Led by shining ranks of rain.
— *Dodge.*
19. —that soft time of sunny showers,
When the wide bloom, on earth that lies,
Seems of a brighter world than ours.
— *Bryant.*
20. Truth is as impossible to be soiled by any out-
ward touch as the sunbeam.
— *Milton.*
21. Sweet April! many a thought
Is wedded unto thee, as hearts are wed.
— *Longfellow.*
22. When proud-pied April, dress'd in all his trim,
Has put a spirit of youth in everything.
— *Shakespeare.*
23. If I say that Shakespeare is the greatest of
intellects, I have said all concerning him.
— *Carlyle.*
24. When wake the violets, Winter dies,
When sprout the elm-buds, Spring is near;
When lilacs blossom, Summer cries,
"Bud, little roses, Spring is here."
— *Holmes.*
25. Speak ye every man the truth to his neighbor.
— *Bible.*
26. I hold that man had better be dead
Than alive when his work is done.
— *Alice Cary.*
27. I propose to fight it out on this line if it takes
all summer.
— *Grant.*
28. The sweet hepatica has heard,
And troops of daffodils
Are throwing kisses to the light,
And nodding to the rills.
— *Wilson.*
29. The ill-timed truth we might have kept,
Who knows how sharp it pierced and stung?
The word we had not sense to say,
Who knows how grandly it had rung?
— *Sill.*
30. Observe the postage stamp! Its usefulness de-
pends upon its ability to stick to one thing
until it gets there.
— *Billings.*

have set aside one day in April for the planting of trees and have called it Arbor Day (which see).

"APRIL FOOL." See ALL-FOOLS' DAY.

APSIDES, *ap'si deez*, in astronomy, two points in the orbit of a heavenly body, one farthest away from, the other nearest to, the body about which it revolves. This is illus-



A AND A REPRESENT THE APSIDES

trated by the point at which the moon is at its greatest distance from the earth and the the point at which it is nearest. An imaginary line drawn between these two points is called the *line of apsides*, or *major axis of the orbit*.

When the moon is at its nearest approach to the earth, it is said to be in *perigee* (meaning *around or near the earth*); when most distant, in *apogee* (meaning *away from the earth*). The earth is in *perihelion* (meaning *around or near the sun*) when nearest the sun; in *aphelion* (meaning *away from the sun*), when at its extreme distance from it. F.B.L.

AP'TERA. See INSECT (Classification).

APTERYX, *ap'tur iks*, a New Zealand bird about the size of a hen, having a long, slender beak, with nostrils near the tip, invisible,



Photo: O. B. O. C.

THE APTERYX

This bird is found only in New Zealand. It is about seven inches in height.

flightless wings, and a rudimentary tail. Its plumage, of a grayish-brown color, is more like hair than feathers. It is a very timid bird, hiding by day and feeding at night on worms, insects, and seeds. In a burrow it

scratches a nest, where it lays one or two white eggs, enormous in proportion to the size of the female. The natives of New Zealand call it *kiwi-kiwi*, on account of its peculiar cry. It is fast becoming extinct, as it breeds very slowly, and great numbers of birds are destroyed by natives, who are particularly fond of their flesh. D.L.

Scientific Name. The apteryx belongs to the family *Apterygidae*. There are several species, constituting the single genus *Apteryx*.

APULEIUS, *ap'ule' yus*. See NOVEL.

AQUA FORTIS, *a' kwah fawr' tis*. See NITRIC ACID.

AQUAMARINE, *a kwah ma reen'*, a fine and transparent variety of beryl, much prized as a gem, of a blue or sea-green color. The stone is found in Siberia and Brazil, and in the United States in Connecticut, Maine, North Carolina, Colorado, and California. According to an old superstition, the aquamarine was worn to counteract the effects of poison. With the bloodstone, it is a birth gem for March. See BERYL; BIRTHSTONES. T.B.J.

AQUAPLANING, *ak' wa playn ing*, an exhilarating sport enjoyed by water enthusiasts who desire something more exciting than swimming. The aquaplane is a small raft attached by a rope to the stern of a swiftly moving motor boat. Another rope, the ends of which are fastened to the front corners of the raft, serves as a driving rein and support for the aquaplanist, who stands upright on the back edge of the plane. Only experienced swimmers should attempt this sport, which grows more fascinating but also more dangerous as the speed of the boat is increased, for whenever the aquaplanist loses his balance, he is thrown at once into the water.

Surf riding has long been a popular sport of the Hawaiians, and this fact probably explains how aquaplaning was introduced into America and Europe. (See illustration, page 334.)

AQUA REGIA, *a' kwah re' ji ah*, the name applied to a mixture of nitric and hydrochloric acids. Its name (from the Latin), meaning *royal water*, refers to its property of dissolving gold, the royal metal of the alchemists. The mixture is usually made by combining one part of nitric acid with from three to four parts of hydrochloric. The chemical action of the nitric upon the hydrochloric acid liberates chlorine, and the latter attacks the metals. See NITRIC ACID; HYDROGEN CHLORIDE. T.B.J.

AQUARIUM, *a kwa' ri um*, a tank or basin in which living specimens of marine or freshwater plants and animals are kept. The sides are usually constructed of glass. No water animals will live long in a vessel containing only water, as the supply of oxygen, on which they live, soon becomes exhausted; therefore

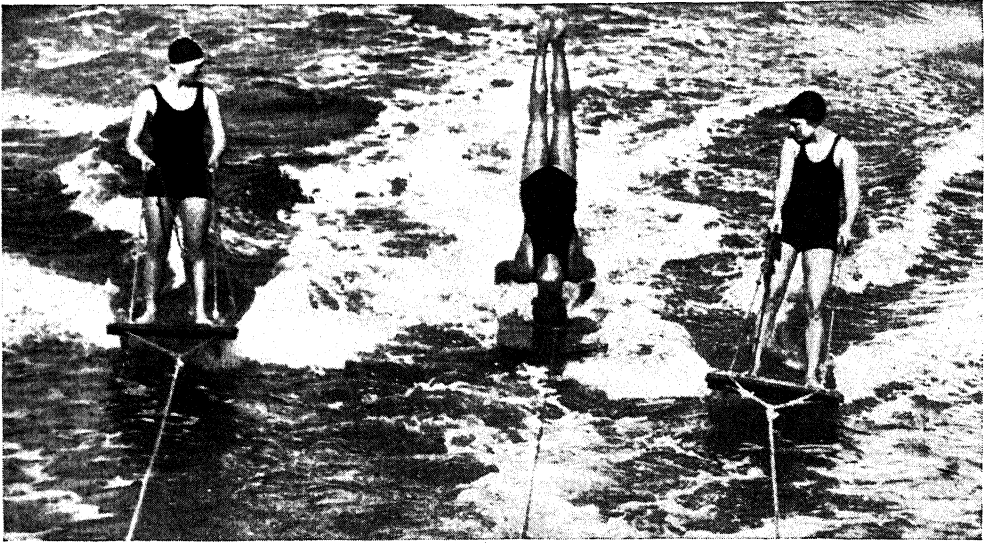


Photo: Wide World

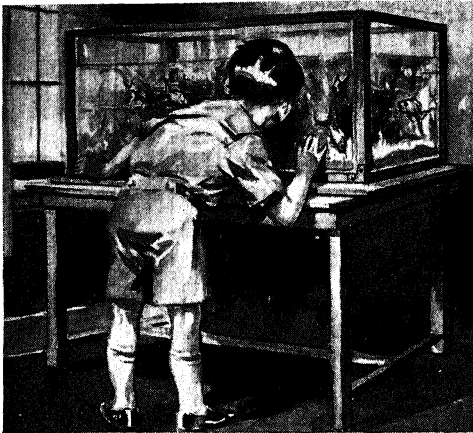
AQUAPLANES AND RIDERS

The happy girl at the left is Gertrude Ederle, the first woman who swam the English Channel.

when plants and animals are put together into an aquarium, they help each other to live. Animals inhale oxygen and breathe out carbonic-acid gas. Plants while in sunlight inhale this gas and throw off oxygen. This exchange balances the life of the aquarium, as long as there are not too many of either plants or animals; too many of either produces an unhealthful condition.

The first illustration shows an aquarium of simple construction which would prove of great

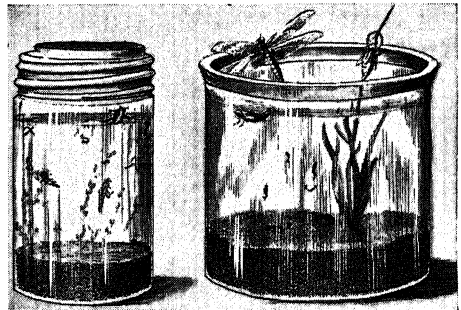
exchange of gases described above. Since it has sides of glass and an open top, the inhabitants can be studied from all points. Each fish with body one inch long requires one gallon of water. The aquarium must not be overcrowded. The bottom should be covered with an inch of clean sand, and a few aquatic plants should be placed appropriately, usually near the corners of the aquarium. A few



AN EASILY BUILT AQUARIUM

Even the smallest schools can afford an aquarium of this simple construction.

benefit to anyone wishing to study the habits of water plants and animals. It must be kept in a well-lighted place, in order to insure the



MADE AT HOME

An aquarium any mother can easily provide for the children.

water snails will help in keeping the aquarium clean, as they eat much of the refuse from the fishes.

If fish move about quietly below the surface they are comfortable, but if they come to the surface and gasp, the water does not contain enough oxygen and some animals must be taken out or more plants must be put in. The second illustration shows what may be accomplished in any home in the study of



Photo: U & U

THE NEWEST GREAT AQUARIUM

The Shedd Aquarium, on the shore of Lake Michigan, in Chicago, is declared to be the finest institution of its kind in the world. It was completed in 1929.

small water life and what may result from it.

The following is a reliable recipe for making a cement that will render an aquarium watertight: Mix one-third litharge to two-thirds red lead (powdered) with raw linseed oil, to the consistency of putty. The litharge and red lead should be thoroughly mixed and freed from lumps before being placed in the oil.

Public Aquariums. Many large cities now have large aquariums where aquatic life may be studied and which attract large numbers of visitors. One of the largest aquariums in the world is in New York, in the famous building on the Battery, formerly known as Castle Garden, where millions of emigrants to the United States have landed. It contains 150 tanks for small fish and a number of big pools for sharks and other large and dangerous fish. Another large one is the Shedd Aquarium in Chicago, on the shore of Lake Michigan, containing 132 exhibition tanks and a large tropical pool. The aquariums of the American Fish Commission at Washington, and those at Naples, Leningrad, Paris, Hamburg, and Brighton (England) are also notable. See NATURE STUDY.

W.N.H.

AQUARIUS, *a kwa' ri us*, meaning *water carrier*, is the name given in astronomy to a constellation and to the eleventh sign of the zodiac. The constellation Aquarius now occupies the position of the twelfth sign, Pisces, owing to the retrogressive motion of the equinoxes. The sun is in the zodiacal sign Aquarius during parts of January and February. The name was given on account of the rains that fall so plentifully in Italy during that season. The symbol of Aquarius is ♒, signifying running water.

F.B.L.

Related Subjects. For a drawing of the constellation, see illustration under ASTRONOMY (The Heavens in Autumn and Winter). See, also, PRECESSION OF THE EQUINOXES; ZODIAC.

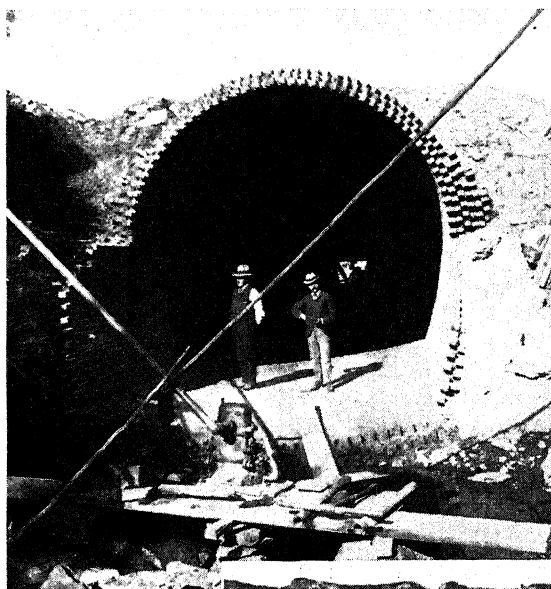
AQUATIC, *a kwat' ik*, **PLANTS.** See WATER PLANTS.

AQUEDUCT, *ak' we dukt*, an artificial channel for the conveyance of water from one place to another. In general use, the term is restricted to a system for supplying a city with water from a distance, and to a stone, concrete, or metal channel in which the downward grade is sufficient to cause the water to flow by gravity. Modern aqueducts frequently combine such gravity channels with other sections in which water is forced up an incline through pressure.

The Story of Modern Aqueducts. Engineering science has overcome almost insuperable difficulties in bringing pure water to cities from great distances.

Croton Aqueduct. In the United States the first important aqueduct was the old Croton, completed by New York City in 1842. The largest city in America has the greatest problems in connection with its water supply. The old Croton Aqueduct has a total length of thirty-eight miles and an average fall of one foot per mile. For most of its length it is constructed of stone, brick, and cement. The water is carried across the Harlem River in iron pipes, the largest having a diameter of seven and one-half feet. It was designed to carry 72,000,000 gallons a day, but was soon found to be too small for the needs of the city. Minor changes were made from time to time to increase the flow, until in 1890 the new Croton Aqueduct was completed.

The new one, like the old, begins at Croton Lake, an artificial body created by damming the Croton River, and runs to 135th Street, where it is connected with the city's distributing system. It passes the Harlem River by an inverted siphon 300 feet below the river bed. For most of its length it is a horseshoe-shaped



Even this great addition to the city's water supply was found inadequate. Beginning in 1925, what are known as the Schoharie and Gilboa dams were constructed. They are over ninety miles north of the city; their waters are impounded in the Ashokan reservoir, which has a storage capacity of 130,000 million gallons. New York has now a water supply which is deemed sufficient for all emergencies, but construction of aqueducts and dams has cost over \$200,000,000. The daily demand for water for Greater New York is close to 1,000 million gallons every day.

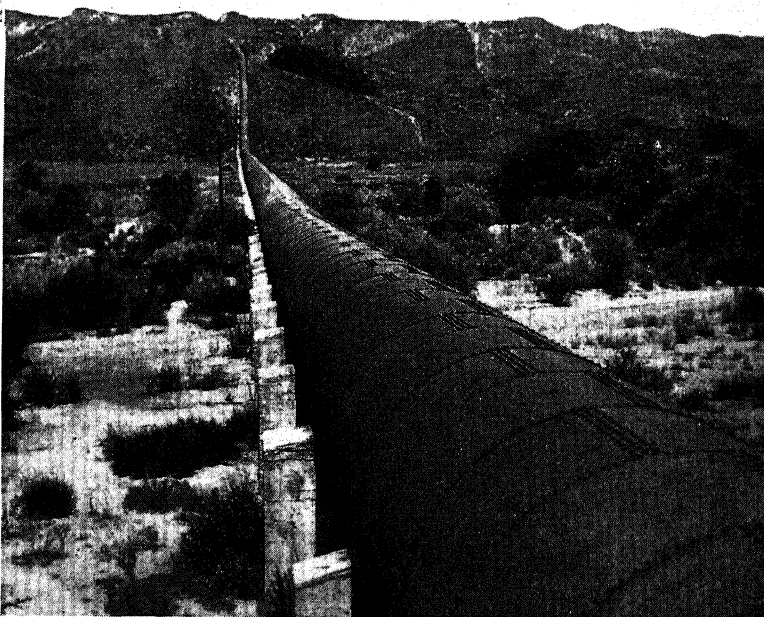
Most of the aqueduct was built by the "cut-and-cover" method; that is, excavations were made, the aqueduct was built in the opening, and the earth was then replaced. Fifty-five miles were constructed in this way, and the remainder was tunneled. One of the most

tunnel thirteen and one-half feet in height and an inch or two wider. Its original carrying capacity was over 300,000,000 gallons a day, but its average flow, because of wear on the interior, is now only 250,000,000 gallons.

Catskill Aqueduct.

This great project, completed in 1913, added a possible 500,000,000 gallons a day to New York's water supply. From its beginning in the Catskill Mountains to the end of the aqueduct proper is a distance of ninety-two miles, and pipe lines and branches in the city add thirty-four miles

more. The water is taken from several rivers in the mountains, and is collected and stored in the great Ashokan reservoir, thirteen miles west of Kingston, N. Y. The reservoir is twelve miles long by one mile wide, with a maximum depth of 190 feet. Two smaller reservoirs are respectively thirty and fifteen miles from the New York Municipal Building.



AT OPPOSITE SIDES OF THE CONTINENT

Above, a section of the Croton Aqueduct, New York; its diameter is apparent from the height of the men standing before an unfinished section. Below, the snakelike aqueduct near Los Angeles, Calif. It is a great steel siphon, with a total length of 250 miles.

Photos: U & U

remarkable features is the tunnel under the Hudson River, near West Point. It is 3,000 feet long, cut in bed rock 1,100 feet below the river's surface. On each shore is a shaft, lined with concrete, with an inside diameter of fourteen feet.

Los Angeles Aqueduct. This is the longest aqueduct in the world, with a length of 250

miles. It was begun in 1907 and was placed in operation in 1914. It diverts the entire flow of the Owens River, in the Sierras, which it receives about ten miles north of Independence, Calif. As the elevation of the intake is 3,800 feet above the sea, and that of Los Angeles only 275 feet, the water flows to every part of the city by gravity. Nearly the whole of the aqueduct was built by the city itself, not by contractors, and its estimated cost was \$25,000,000.

Future needs have been anticipated by a plan to construct a still longer aqueduct from the Colorado River; when eventually this work is completed, Los Angeles will have a water supply sufficient for the needs of 5,000,000 people.

Hetch Hetchy Project. San Francisco solved the problem of an adequate supply of pure water by constructing a system of aqueducts and tapping the Tuolumne River, 150 miles east of the city. One notable part of the project is a tunnel through the mountains 18.3 miles long. The total cost of the project was about \$80,000,000. The name Hetch Hetchy is that of a valley in Yosemite National Park and Stanislaus National Forest. In 1913 Congress gave to San Francisco permission to tap the watershed there for its water supply.

Tulsa Aqueduct. The city of Tulsa, Okla., receives its water supply from a point fifty-five miles distant, through one of the world's longest aqueducts of its kind—reinforced concrete. Water is acquired from Spavinaw Creek, and is impounded in a reservoir having a dam over fifty feet in height.

In Mining and Irrigation. The name aqueduct is sometimes applied to ditches and other channels used in mining and in irrigation. Occasionally these are permanent structures of stone or concrete, but more often they are temporary structures of wood and are properly called *fumes*, not aqueducts. Some irrigating systems require as much water as a fair-sized

city, notably in the western part of Canada and the United States. For details, respecting construction work of this nature, see IRRIGATION.



ONE OF ROME'S IMPERISHABLE AQUEDUCTS

This one was built by the Emperor Claudius. See the article CLAUDIUS, in these volumes.

In Former Times. Aqueducts were in use among the ancient Egyptians, Phoenicians, Persians, and Greeks, but they were most common in the Roman Empire, where they reached astonishing proportions. Ancient Rome was supplied with water by eleven great aqueducts, parts of which were carried on high bridges which still stand as monuments of Roman art and engineering. Two of these are used today to supply water to the modern city of Rome. In many other parts of Europe, from Constantinople to Nîmes, France, are ruins of aqueducts built by

the Romans. The Pont du Gard, fourteen miles from Nîmes, is unrivaled for boldness of design. It is built of huge blocks of stone, and consists of three tiers of arches across the valley of the River Gardon. Each large arch in the two lower tiers has a span of sixty and seventy-five feet, respectively, and the height of the structure is 160 feet. The aqueduct at Segovia, Spain, built by the Romans in the first century after Christ, has two tiers of arcades, which reach a height of 102 feet. It is 2,400 feet long, and is one of the most admired works of antiquity.

During the Middle Ages the construction of aqueducts almost completely ceased, but with the Renaissance came a new development. The Popes at Rome restored some of the ancient structures which had fallen into disuse, and several new ones were built in France. One of the most remarkable of these was begun by Louis XIV in 1684, to carry water from the Eure River to Versailles. Forty thousand soldiers worked four years on this task, which was never completed because wars intervened. Most ancient aqueducts were of stone, or of brick and concrete, but the extensive use of iron and steel pipes has now rendered the construction of the old type undesirable.

Gravity is now frequently aided by pressure, and the aqueduct bridges are usually supplanted by inverted siphons (see SIPHON). The bridge form, however, is still used, not only for supplying water to towns, but also in many irrigation projects.

One of the first of the great aqueducts built by European cities was that from Loch Katrine to Glasgow, completed in 1860. Manchester, England, is supplied by an aqueduct, completed in 1892, nearly ninety-six miles long. Of this length, thirty-six miles are concrete conduit, fourteen and one-half miles are concrete tunnels, and forty-five miles are iron pipe. Liverpool, Vienna, Paris, and many other cities have long aqueducts.

AQUEOUS, *a' kwe us*, **AMMONIA**. See **AMMONIA**.

AQUEOUS HUMOR. See **EYE**.

AQUINAS, *a kwi' nas*, **SAINT THOMAS** (1227-1274), a celebrated divine, called by his fellow-students at Cologne the "dumb ox," but years later by his pupils "the Angelic Doctor." He was a member of the Dominican Order, and taught at Cologne, Rome, Bologna, and Pisa, showing such learning and piety that he was looked up to as one of the foremost churchmen of his time. His greatest work, the *Summa Theologiae*, is a "summing up" of the theological system of the Roman Catholic Church, and stands to-day as a standard authority. Aquinas was declared a saint by Pope John XXII in 1323.

ARABESQUE, *air a besk'*, a term employed in a narrow sense to describe a certain kind of fantastic ornamentation which the Arabs and

were never used, because the Koran forbade it, and architects and artists confined themselves to geometric devices, foliage, fruit, floral forms, and the like, which were arranged in elaborate designs. The most beautiful Moorish arabesques are found in the Alhambra, Spain, and the best examples of Roman work in this style are the paintings of Raphael, in the Vatican, imitated from earlier friezes.

Meaning. The word *arabesque* is translated to mean in the Arab style

ARABIA, *a ra' bi ah*, a great peninsula of Southwestern Asia, a land of romance, of deserts, and unexplored waste, toward which the eyes of the world for centuries have been turned, chiefly because it is the home of one of the great religions, Mohammedanism. Within recent years, the countries which have developed within the peninsula have commanded world attention because of the spirit of nationalism which the World War evoked. From it came, too, in centuries past, the beginnings of so many of the arts and sciences that the story of this ancient land is well worth knowing.

The first Europeans went to Arabia seven hundred years before the birth of Christ; to-day ships of all nations pass its seaboard in a never-ending procession, but in twenty-six hundred years white men have penetrated for residence fewer than a dozen miles into the interior. The only spot on the entire coast where they have a permanent foothold is at Aden, on whose rocky shore, where it is hotter all the year than in any other place on earth, a British garrison is stationed. No fleets or forts are needed by the Arabs to prevent their being overrun by Caucasians; the latter cannot endure the desert and the hot sun. In over half of the peninsula the temperature rises frequently to 130°, and there is little or no shade.

The Land. Including the Syrian Desert, Arabia has a length of 1,500 miles, while its greatest breadth is 1,200 miles. From its northern to its southern boundary, the distance is almost as great as from New York to Denver, and its total area, 1,200,000 square miles, is about one-third that of the United States, with Alaska and its island possessions included. In estimating its population authorities differ, some placing it as high as 7,500,000, others as low as 6,000,000. This difference is accounted for by the fact that in no part is there any regular census, and no definite information is to be had respecting a large part of the central desert regions.

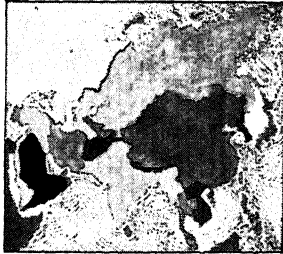
Within the vast area of Arabia there are no such varieties of climate, soil, and resources as are found within the United States. For while the surface is diversified into central table-land, surrounding deserts, and ranges



ARABESQUE ORNAMENTATION

Moors used on their buildings. More generally, the word denotes any kind of ornamentation of a fanciful character, whether of painting or sculpture. In the arabesques of the Mohammedans the figures of men and animals

of mountains parallel to and approaching the coast, one condition prevails almost everywhere—extreme dryness. There are relatively small territories elsewhere on the earth's surface which are as dry, but nowhere else except in the Sahara is so large an arid region to be found. In mountain and in lowland, the date palm is often the only sign of vegetable life, and there are districts which in the course of a year do not have a shower of rain. There are dried-up river courses which show that once the country must have had abundant water, and in a few of them there are trickling streams during the so-called rainy season, but in all Arabia there is not a real river. Thousands of square miles in the interior comprise deserts dryer than the Sahara; much of this area has never been explored. The reason for the extreme dryness and heat is that almost all the winds come from the northeast, across the hot, arid regions of Central Asia.



ARABIA

Location marked in black.

In such a climate few things will grow except the date palm, which furnishes the staple article of food; but there are spots where figs, grapes, and corn thrive in good years, and the province of Yemen, in the southwest, exports the excellent Mocha coffee, and raises wheat, barley, and millet. In the oases, wild animal life is fairly abundant, ostriches, gazelles, jackals, hyenas, and even lions being not uncommon. Of the domestic animals, the Arabian horses and camels are world-famous. The Arabian horses are among the most beautiful and high-spirited breeds in the world, but it is the camel upon which the Arab mainly depends—the “ship of the desert”—which alone makes it possible for him to travel across the arid, sandy wastes.

The Divisions of Arabia. Until the end of the World War, Turkey exercised control over almost the entire peninsula; Britain's small territory at Aden was practically alone, outside of Turkey's actual or claimed jurisdiction. Turkish control was fiercely opposed throughout a great portion of the territory. With the claims of Turkey annulled, independent states were organized. The kingdom of Hejaz, containing the holy city of Mecca and important Medina, with a long coast line on the Red Sea, became for a time an important kingdom. Its king, Hussein, was powerful enough to place one of his sons, Abdullah Ibn Hussein, on the throne of the new Transjordan king-

dom, and another son, Feisal, was made king of Iraq.

A strong Arab kingdom in the desert interior is the Nejd, whose people are Wahhabi tribesmen who successfully resisted the Turkish yoke for hundreds of years. It has a strong leader, Ibn Saud, probably the foremost man in Arabia. His hatred for the aged Hussein, who had aspirations toward the Caliphate, led him to conquer the Hejaz, and in 1925 he proclaimed himself king of Hejaz and sultan of Nejd.

Yemen was under the Turkish dominion, and since its independence was secured, has been striving under the rule of three sultans to reach settled conditions; Aden, in Yemen, is a British protectorate. The commercial possibilities of Yemen are great; it is the center of the Mocha coffee industry.

Transjordan joins Palestine on the east, and the native government is under the Palestine mandate officials.

Oman is an independent sultanate, whose capital is Muskat. The present dynasty has ruled since 1741.

Asir cannot be adequately described, for its destiny is uncertain. It is at present in the hands of Ibn Saud of the Nejd.

Palestine, the home of early Christianity, is independent of the Turks, and is under mandate to Great Britain.

[In their alphabetical order in these volumes will be found descriptions of all the political divisions of Arabia.]

The People. The strongest people among the Arabs are the Wahhabis, who may be called the Puritans of the Mohammedan world. They adhere to the strictest letter of the commands of the Koran, and go beyond the requirements of their faith in their religious observances. They are the people who have made the Nejd the greatest political power in the entire peninsula.

[For adequate description of Arab characteristics, see the article ARABS.]

Transportation. The only railroad in the peninsula parallels the coast of the Red Sea, entering from Transjordan, and now reaching to Medina, with ultimate terminus at Mecca. The caravan of ancient times remains the mode of transportation throughout the remainder of the vast area; the country is today a lively cross-roads of regular caravan lines. Every yard of cloth, every case of cartridges, every gun—and machine gun, too—used anywhere in the peninsula, except in part of Hejaz, where there is a railroad, is carried on the backs of camels, and well-observed rates for passengers and freight are in force. A caravan may consist of a dozen camels or of a thousand or more; the larger

it is, the better able is it to ward off attack by Bedouin raiders.

Religion. Although divided politically, religiously Arabia is a unit, for Mohammedanism everywhere prevails. To the Arab, the greatest blessing on earth is to be able to make a pilgrimage to Mecca and so receive forgiveness for all his sins.

History. The history of the Arab peoples previous to the time of Mohammed is obscure, but with his advent the Arabians united for the purpose of extending the new creed; and under the caliphs, the successors of Mohammed, they obtained great power and founded large kingdoms in three continents.

On the fall of the Caliphate of Baghdad in 1258, the decline set in, and when the Moors were driven from Spain in the fifteenth century, the foreign rule of the Arabs came to an end. In the sixteenth century Turkey conquered Hejaz and Yemen and received the nominal submission of the tribes inhabiting the rest of Arabia. The subjection of Hejaz continued to 1918, but Yemen became independent in the seventeenth century and remained so till 1871, when the territory again fell into the hands of the Turks, to be liberated only at the end of the World War.

In 1839, Aden was occupied by the British. Oman early became virtually independent of the caliphs, and grew into a well-organized kingdom. The Wahhabis appeared toward the end of the eighteenth century and took an important part in the political affairs of Arabia, but their progress was interrupted by Mohammed Ali, pasha of Egypt, and they were completely defeated by Ibrahim Pasha. He extended his power over most of the country, but events of 1840 in Syria compelled him to renounce all claims to Arabia. So much of the territory is practically worthless that there has never been the fierce contention over it that there has been over more favored spots. Turkey's attempts at control were undisputed outside the peninsula.

Other Items of Interest. Arabia was the first country outside of Ethiopia to adopt coffee drinking.

The southwestern corner of the country is known as *Arabia Felix*, which is Latin for

Fortunate Arabia. Behind it rise mountains to a height of perhaps 8,000 feet, cutting off from the interior the rain-laden winds which give Arabia Felix ample rainfall during the whole summer.

Herodotus wrote, in the fifth century B.C.: "The Arabs keep pledges more religiously than almost any other people." This virtue has been noted by travelers in all times to the present day.

The prefix *al-* in an English word frequently shows that it is of Arabian origin, for *al*, like

the Italian *il* and the Spanish *el*, means *the*. We find it in many familiar proper names, like Allan, Aladdin, Algeria; in names of Arabian sciences like algebra and alchemy; in alcove, alfalfa, and alkali; in the names of stars, as Aldebaran and Algol; and in a large number of Spanish words, such as Alcazar and Alhambra.



Photo: Visual Education Service

BOYS AND GIRLS OF ARABIA

These are representative of the higher class of society. Peasant boys and girls, as a rule, are very poorly dressed.

in these volumes to the following

Aden
Arabs
Caliph and Caliphate
Hejaz
Mecca
Medina
Mandated Territories
Mohammed

Related Subjects.
The reader is referred to the following articles:

Mohammedanism
Nejd
Oman
Palestine
Transjordan
Wahhabis
World War
Yemen

ARA'BIAN NIGHTS, OR THE THOUSAND AND ONE NIGHTS, one of the most famous collections of stories in the world, loved by children for the charm and wonder of the old tales, and consulted by scholars for their pictures of the customs and manners of the Orient. It is supposed that the stories had their origin in India, that Persia adopted them, and that it was from the latter country that the Arabs received them. To-day they are printed in many languages—probably in more than any other book except the Bible. It was early in the eighteenth century that they were introduced into Europe.

There are over two hundred tales in the complete editions of the *Arabian Nights*, and these are woven into one story by the following device:

According to the first story, the Sultan Shahriyar has made a law that every one of his future wives is to be put to death the morning after her marriage, and one beautiful

girl after another has met that cruel fate. At length Scherazade, the daughter of the grand vizier, offers to become the sultan's bride, but begs her sister to visit her on the morning after her wedding and request that she be allowed to tell one last story before she dies. The scheme is carried out, the request is granted, and the sultan becomes so interested in the tale that he declares she must live until he has heard the end of it. Thus, by breaking off each night in the middle of a thrilling narrative, she keeps the sultan interested and saves her own life; for by the time she has entertained him for one thousand nights he has fallen in love with her, and has decided that she is as good as she is clever.

So well known are some of these stories that people anywhere will understand references to Aladdin, to Ali Baba, to the Old Man of the Sea, or to the Magnetic Mountain which drew the nails out of the ship that came near it. See ALADDIN; ALI BABA.

ARABIAN SEA, that part of the Indian Ocean between Arabia and India, north of a line drawn from Cape Comorin, at the southern extremity of India, to Cape Guardafui, on the east coast of Africa. The Red Sea and the shallow Persian Gulf are properly arms of the Arabian Sea. In ancient times, the Arabian Sea was of great importance as a commercial route; goods from the Far East were brought by ship to its shores and carried by caravans to the Mediterranean. With the opening of the Suez Canal in 1869, the sea became a main highway of commerce, and the old caravan routes were abandoned.

The most important of its islands are the Laccadives, off the west coast of India, and Sokotra, northeast of Cape Guardafui. On the east it receives the waters of the great River Indus and indents the Indian coast with the gulfs of Cutch and Cambay. See map, article ASIA.

ARABIC, *air' a bik*, **NUMERALS** are the common figures used in writing numbers to-

1 2 3 4 5 6 7 8 9

OLD ARABIC NUMERALS

day, but they have been employed among Europeans only since the twelfth century.

Before that time, letters were employed, as in the so-called *Roman numerals*, which are I, V, X, L, C, D, M. When the Moors established themselves in Spain, in the eighth century, the Christians looked upon them with the most intense disfavor, and had at first no dealings with them save to fight them in war, but they were soon forced to admit that in most respects the Moors possessed the superior culture and civilization. Especially did they know how to calculate.

At length, many Christian scholars, desiring knowledge more than they hated the Moors, went to their schools and universities, where they learned among other things that wonderful art of calculating which developed into what is now called *arithmetic*. They learned, too, to make certain new symbols which proved so very useful that they speedily spread over all civilized Europe. These were the Arabic numerals, 1, 2, 3, etc. That the Arabs did not invent these figures is now regarded as certain, and it seems probable that they acquired them from India; but research has failed to show the real beginning of the figures which play so large a part in the world's activities. See ARITHMETIC; ROMAN NUMERALS. J.W.V.

ARABS, *air' abz*. This name is given to the inhabitants of Arabia and the neighboring lands. They are a branch of the Semitic race, and before the Christian Era they occupied all of the Arabian peninsula. The Arabs are of interest not only because they have preserved in much greater degree than most peoples the purity of their original stock, but also because they rank unusually high among the races of mankind that had been deemed inferior. It will doubtless be a surprise to learn that authorities regard them as the most perfect race physically, and as one of the most highly endowed mentally.

Characteristics. They are tall and of proportions that an athlete might envy; and the black eyes set above their aquiline noses shine with intelligence. The Arabs of Arabia are always very clean, the Koran making frequent bathing obligatory, but those in other lands often keep the letter but not the spirit of this command by bathing in sand instead of water.

Though they have lost that remarkable aptitude for science which was responsible for the birth of chemistry and astronomy and the



Photo: O R O C

A REAL "STREET ARAB"

This boy was photographed outside of the walls of Jerusalem. He does not need to fear the "evil eye," for the necklace and charm around his neck are supposed to protect him from all danger.



ARAB TYPES

- (a) North African, in joyous mood.
 (b) Arab woman, with face covered, according to centuries-old custom.

- (c) Nomadic, or wandering, Arabs, and the only home they know.
 (d) Interior of Arab house, North Africa.

great advancement of geography and mathematics, the Arabs still put a high value on education. Few indeed are the men and boys, even of the desert tribes, who cannot read and write, but like all Mohammedans, they consider that women do not need education.

The Arab is unusually hospitable; he will stand by his pledged word even to death, and never forget a favor; yet he does not forget an injury, and his vengeful spirit makes the repaying of it a chief aim of his life. An Arab, especially one of the wanderers, or nomads, appears to have no idea of property rights; he will protect with his life a transient guest, but later will follow and rob him.

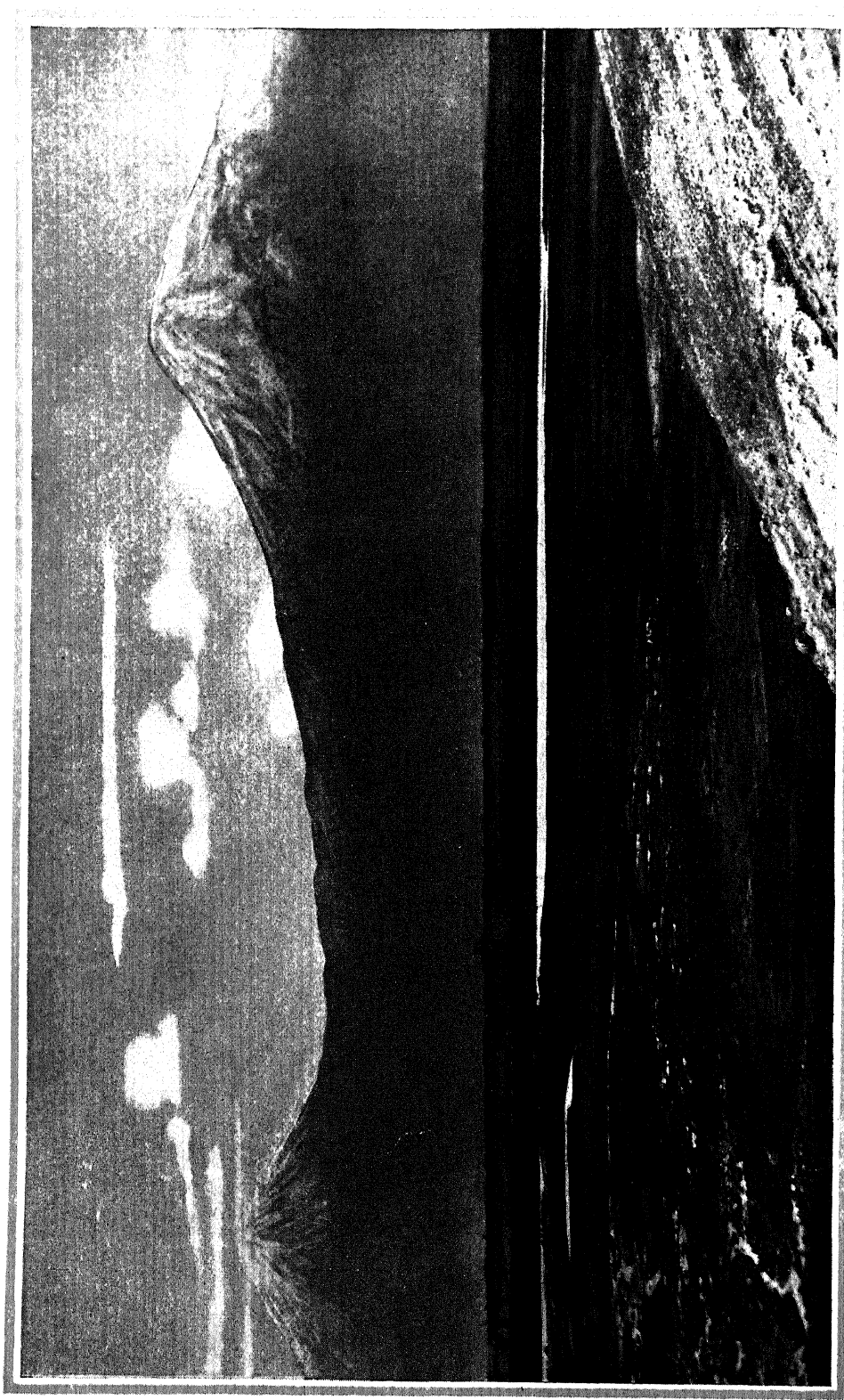
Manner of Life. Not all of the Arabs live in Arabia. The crusading zeal of Mohammedanism led them into all the neighboring countries, and they have made North Africa distinctly their own. Their civilization there is much like that in Arabia. The town dwellers have for the most part remained true to the architectural forms evolved by their Arabian ancestors; the desert wanderers hold to the same primitive customs as their brothers in Arabia. In the accompanying picture, the interior shown is that of a North African house, but it might be the dwelling of a wealthy family in Mecca.

The traveler approaching an Arab town sees one characteristic thing—the inevitable sur-

rounding wall. It is of no use as a defense, for it is made of dried mud, but custom has decreed that it shall be there. Many of the houses are of sun-dried bricks, though the poorer people cannot afford such luxury, and must content themselves with shelters of woven branches or homes of rude tents. Fortunately, most of the lands in which the Arabs live are very dry; otherwise every village and town would be a breeding place for disease, for absolutely no attention is paid to drainage.

Nomads. Perhaps the most interesting of the Arabs are the nomads, or wanderers. These Bedouins, as they are called, are full-blooded Arabs, who live not in town but in tents on the edges of the deserts and in the oases. With their herds of camels they roam from place to place, following the same course year after year, unless a scarcity of grass for their camels compels them to go elsewhere. They live on the milk of camels and the cheese made from it, together with such dates and bread as may be obtained by barter. When the season is especially dry, the camels starve, particularly the young ones, and there is not enough milk to keep the men, women, and children from suffering. Then it is that the Bedouins rob and plunder.

Caravans. Fear of these desert robbers is one reason why the merchants of Arabia travel



Wide World Photo

TWIN-PEAKED ARARAT, WHERE RESTED NOAH'S ARK

in caravans rather than singly. With their trains of laden camels they cross the deserts over trails that to unaccustomed eyes would be invisible. This method of travel dates back with little change to centuries before the Christian Era, for the Arabs have made slight advance in customs. E.D.F.

Related Subjects. The reader is referred in these volumes to the following articles:

Arabia	Mohammedanism
Bedouins	Nomad Life

ARACHNE, *a rak' ne*, according to Greek legend, a girl who was so proud of her ability to weave that she dared to match her skill with that of the great goddess Athene, or Minerva. For her presumption, Athene changed her into a spider, that she might spend her life in spinning. See MYTHOLOGY, for this story.

The closeness of the connection between this myth and nature is shown by the fact that *arachne* is the Greek name for *spider*. And when scientists were seeking a general name which should include all spiders, as well as the mites and scorpions, they used this word as a basis, calling the whole class of animals *Arachnida* (see article below).

ARACHNIDA, *a rak' ni dah*, a class of small animals that are sometimes confused with insects. The best-known arachnids are the spiders; others are the scorpions, mites, and ticks. Typical arachnids differ from true insects in having the head and thorax united, and in possessing four pairs of legs. Insects have the body in three distinct parts—head, thorax, and abdomen—and they have three pairs of legs. Insects also possess feelers, or antennae, but arachnids lack these organs.

The Arachnida have simple eyes, varying from two to twelve in number. Some breathe by means of air tubes, like insects, and others possess "lungs" in the form of small sacs containing blood-filled, leaflike plates opening on the under side of the abdomen. Many of the Arachnida are parasites. The parasitic species feed chiefly on animal matter, but some of the mites live on plant juices. S.E.S.

Classification. The arachnids belong to the subkingdom *Arthropoda*, composed of jointed-foot animals. The name *Arachnida* is derived from the Greek for *spider* (see article ARACHNE, above).

Related Subjects. The reader is referred in these volumes to the following articles:

Daddy-Long-Legs	Spider
Itch	Tarantula
Jigger	Tick
Mites	Trapdoor Spider
Scorpion	Zoölogy

ARACHNOID, *a rak' noyd*, **MEMBRANE**. See BRAIN.

ARAGO, *ah' ra go*, DOMINIQUE FRANÇOIS (1786-1853), a celebrated French astronomer and statesman who made such great personal

sacrifices in behalf of science that the Paris Academy of Sciences broke one of its standing rules and elected him, though too young for that honor, to be one of its members. In 1806, while in the Pyrenees Mountains working on the measurement of an arc of the meridian for the French government, he was captured by the Spanish as a spy, and succeeded in reaching his native country only after going through great hardship and suffering many narrow escapes. He became life secretary of the Academy of Sciences in 1830, and his work as a scientist included several important discoveries in electromagnetism. He also held a number of public offices, and was known as the champion of the people's rights. Arago wrote about sixty scientific works.

ARAGON. See CASTILE AND ARAGON.

ARAGO WHITE SPOT. See DIFFRACTION.

ARAL, *air' al*, **SEA**, a large lake in Turkestan, about 150 miles east of the Caspian Sea. Its waters are salty, but less saline than those of the ocean. Because of its isolation and the character of the surrounding country, it has been of little value to the world. It covers an area of 26,000 square miles, and is therefore one of the largest inland bodies of water. It is fed by the Amu-Darya, or Oxus, and the Syr-Darya, or Jaxartes, rivers. The lake contains an abundance of sturgeon and other fish, and has a large number of islands. Navigation on it is difficult because of the shallowness of the waters and the fierce and sudden storms from the northeast. For location on map, see ASIA.

ARAMAIC, *air a ma' ik*, an ancient language allied to the Hebrew, spoken in Syria, Palestine, and eastward to the Tigris and Euphrates rivers, at the time of the Persian dynasties. It gradually supplanted Hebrew as the popular tongue, and was the vernacular of Palestine at the time of Christ. The Books of *Ezra* and of *Daniel* were written partly in the Chaldean dialect of Aramaic, and the Syriac dialect was used extensively, particularly in literature, up to the thirteenth century. It was supplanted by Arabic. See HEBREW LANGUAGE AND LITERATURE.

ARAPAHO, *a rap' a ho*. See INDIANS, AMERICAN (Most Important Tribes).

ARARAT, *air' a rat*, a celebrated mountain of Armenia, in Western Asia, on which Noah's ark is supposed to have rested when the waters of the Deluge subsided. It is a volcano of two cones, the highest being 17,212 feet above the sea. The last eruption occurred in 1840 and caused great destruction of life and property. The mountain is at the intersection of Persia, Turkey, and Russia, and its summit is in the latter country. See NOAH; DELUGE.

See illustration, on opposite page.

ARAS, a rahs', RIVER. See ARMENIA.

ARBELA, *ahr be' lah*, a city of ancient Assyria. See ASSYRIA; FIFTEEN DECISIVE BATTLES; ALEXANDER THE GREAT.

ARBIL, *ahr' bil*, a town in Iraq, in the province of Mosul, on the site of ancient Arbela. See ASSYRIA (The Cities).

ARBITRATION, a peaceable, semi-judicial method of settling disputes between individuals or nations. The word is derived from the Latin *arbitratio*, meaning an *examination* or *judgment*. The essential principle in arbitration is that the examination is made by impartial umpires, who render the final judgment. A board of arbitration may, and usually does, include representatives of the parties to the dispute, but it is customary to include one or more neutral persons whose interests are not affected by the case. It is the practice of the courts to uphold decisions reached through arbitration.

A fundamental difference must be noted between arbitration involving individuals and that involving nations. Arbitration by individuals has been made compulsory in many parts of the world, particularly in labor disputes. The most conspicuous example is in New Zealand, where strikes and other problems of labor must be arbitrated, and failure to carry out the award of the arbitrators is punishable by law. Arbitration between nations is purely voluntary, and no international power, except war or the threat of war, exists to force a nation to accept an award which it regards as unjust.

In Civil Cases. Arbitration is a simple method of settling many cases without the delay and expense of a long legal process. It is especially desirable if the amount at issue is small, when the court costs and other fees would be greater than the money or value of property involved. In a few states, arbitration is compulsory, if one of the parties desires it, although nearly everywhere it is voluntary. In England, arbitration may be at the request of the parties concerned, or at the order of the judge, who appoints a referee.

Industrial Arbitration. As a method of settling disputes between employers and employees, arbitration is increasing in popularity, especially in those industries on which the general public is dependent for its comfort or security. Examples of this tendency have been seen in the settlement at various times of industrial strikes in the United States, England, and Wales, all resulting in substantial gains to the workers. Strikes of employees of steam, electric, and street railways are frequently settled in this way. In addition to New Zealand, several states of Australia enforce compulsory arbitration, but this method has made slow progress in other parts of the world. Several states of the American Union have boards of arbitration, which may inves-

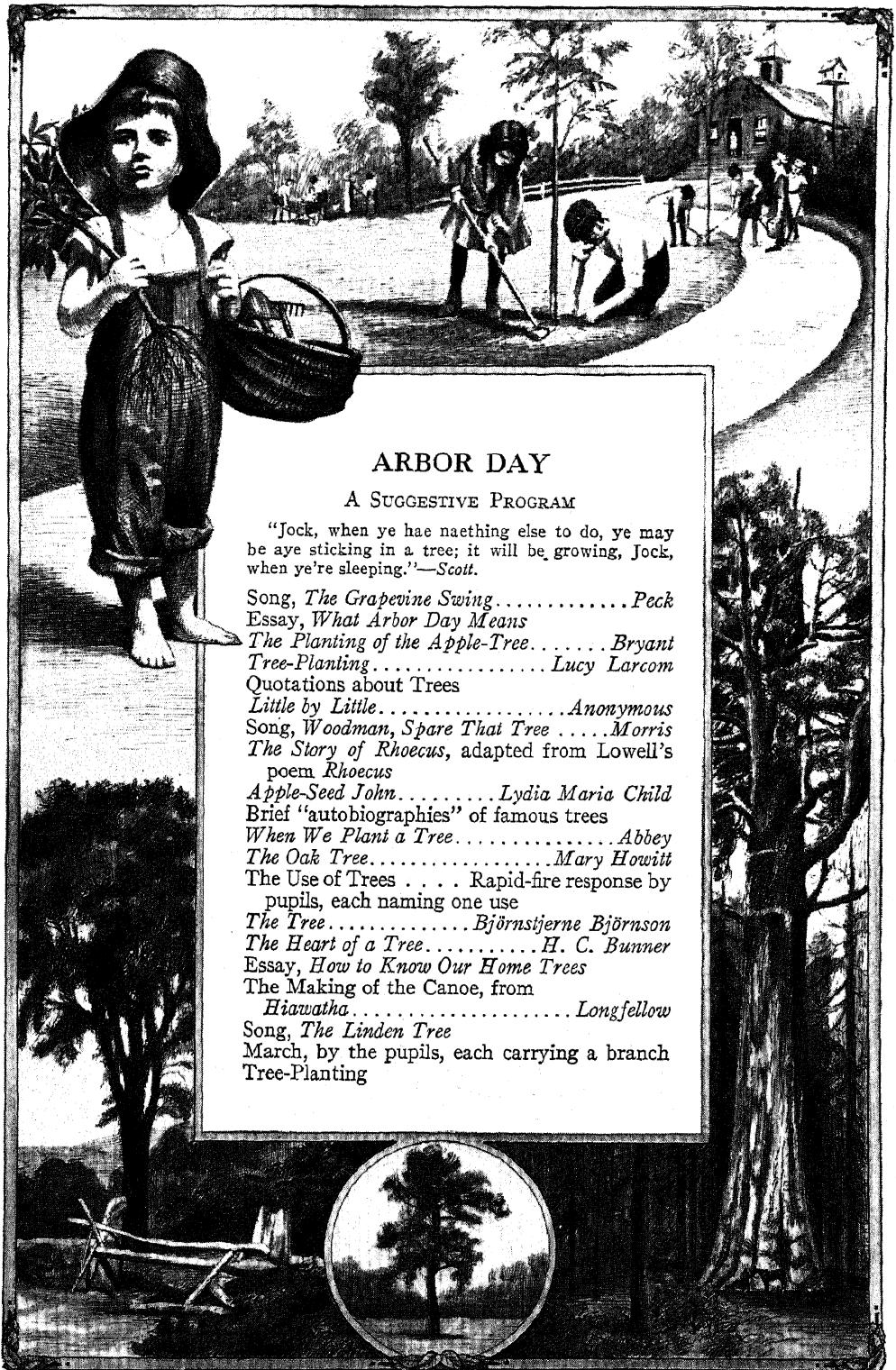
tigate disputes on their own initiative or at the request of one of the parties. In Kansas, an Industrial Court was established in 1920; its right to fix wages was denied by the United States Supreme Court in 1923. The United States Railroad Labor Board, authorized by the Transportation Act of 1920, was established as a medium for arbitration and conciliation. In Canada, the Dominion Department of Labor frequently settles labor disputes.

International Arbitration. From ancient times to the present, many disputes between nations have been settled by arbitration. The Greeks and Romans regarded foreigners as barbarians, and generally refused to consider arbitration with another nation, but between the various Greek states it was a common occurrence. In more modern times, the Pope has been chosen frequently as arbitrator—for example, when Pope Alexander VI drew the line of demarcation between Spanish and Portuguese possessions in the two Americas, and when Pope Clement XI was the third arbitrator under the terms of the Treaty of Ryswick. In the nineteenth century, Great Britain and the United States have several times arbitrated their disputes. Perhaps the greatest step in the effort to eliminate war as the result of disputes was the establishment of the Permanent Court of International Justice; this was achieved after the World War, and it superseded to a degree the Hague Tribunal, which was designed as an international court. Many nations have signed individual arbitration treaties with other nations. The United States, through Secretary of State Bryan, proposed and ratified in 1914 a series of such treaties with most of the leading nations of the world. In 1928 Secretary of State Kellogg secured arbitration treaties with sixty nations of the world, with a view to end war.

Related Subjects. The reader is referred in these volumes to the following articles:

Alabama, The	Demarcation, Line of
Bering Sea Controversy	Peace Conference, International
	Permanent Court of International Justice

ARBOR DAY, a day set apart for the planting of trees. Honored most of all by the children of the public schools, the day's observance is a part of the movement to save and renew the forests and other natural resources (see CONSERVATION). The first Arbor Day was celebrated in Nebraska in 1872, and was the idea of Julius Sterling Morton, Secretary of Agriculture under President Cleveland. Mr. Morton deplored the fact that his state should be almost treeless, and that in other parts of the country destruction of timber areas had been widespread. Since that time other states and a number of Canadian provinces have one by one adopted the plan which he developed, and now a large proportion of



ARBOR DAY

A SUGGESTIVE PROGRAM

"Jock, when ye hae naething else to do, ye may be aye sticking in a tree; it will be growing, Jock, when ye're sleeping."—*Scott*.

Song, *The Grapevine Swing*.....*Peck*

Essay, *What Arbor Day Means*

The Planting of the Apple-Tree.....*Bryant*

Tree-Planting.....*Lucy Larcom*

Quotations about Trees

Little by Little.....*Anonymous*

Song, *Woodman, Spare That Tree*.....*Morris*

The Story of Rhoecus, adapted from Lowell's poem *Rhoecus*

Apple-Seed John.....*Lydia Maria Child*

Brief "autobiographies" of famous trees

When We Plant a Tree.....*Abbey*

The Oak Tree.....*Mary Howitt*

The Use of Trees Rapid-fire response by pupils, each naming one use

The Tree.....*Björnsjjerne Björnson*

The Heart of a Tree.....*H. C. Burner*

Essay, *How to Know Our Home Trees*

The Making of the Canoe, from

Hiawatha.....*Longfellow*

Song, *The Linden Tree*

March, by the pupils, each carrying a branch
Tree-Planting

them observe Arbor Day, either fixed by law or named by proclamation. In Canada and in most of the Northern states, it comes late in April or early in May; in the Southern states, between December and March. See TREE; MORTON, JULIUS STERLING.

ARBOR VITAE, *ahr' bor vi' te*, the Latin for *tree of life*, is the popular name for a genus of cone-bearing evergreen trees and shrubs found in north temperate regions. The name is thought to refer to the reputed medicinal properties of the resinous bark and twigs. In general, these trees resemble cypresses, and like the latter, are much used in cemeteries. They have flattened branchlets, with small scalelike leaves overlapping like the shingles on a roof. The common *arbor vitae*, or *white cedar*, is a native of North America, where it grows to heights of fifty to sixty feet. In New England it is often planted for hedgerows.



ARBOR VITAE

Appearance of tree and detail of branch.



Photo: Visual Education Service

TRAILING ARBUTUS

Darlings of the forest!
Blossoming alone
When Earth's grief is sorest
For her jewels gone—
Ere the last snow-drift melts
Your tender buds have blown.

—COOKE.

The wood is used for fence posts, railway ties, and shingles. G.M.S.

Scientific Name. Arbor vitae belong to the pine family, *Pinaceae*. The common arbor vitae is classed as *Thuja occidentalis*.

ARBUTUS, *ahr bu' tus*, the name given to a number of evergreen plants of the heath family, most of which

are shrubs or tall trees, though some are tiny and inconspicuous. In Eastern and Central Canada and the United States, the best-known is the *trailing arbutus*, a creeping plant with shining, evergreen leaves and dainty white or pink flowers, which have a delicious fragrance. The trailing arbutus is one of the earliest wild flowers of spring, and one of the best-

loved. In New England, the plant is commonly called mayflower, a name said to have originated with the Pilgrims (which see). Whether they gave the arbutus this name in honor of the ship that bore them from England, or in memory of the true mayflower of England, or because the sight of the cheerful flower peering out from the snows of winter gave promise of a happier time ahead, we do not know. The mayflower, so called, is the flower emblem of Massachusetts, but its existence there and in other sections of the East is seriously threatened by thoughtless pickers of wild flowers, street vendors, and even botanical classes. This is one of the native wild flowers that the Wild Flower Preservation Society of America is trying to save. B.M.D.

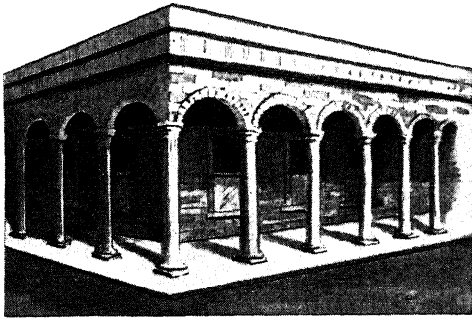
Scientific Name. The trailing arbutus belongs to the family *Ericaceae*. Its botanical name is *Epigaea repens*.

ARC. See CIRCLE.

ARCADE, from the Latin word for *bow*, is the name given to a series of arches supported by columns or piers. As a rule, there is a passageway or promenade behind the arcade, as in the case of the cloisters in the old monasteries, where the monks used to gather for recreation and exercise. Such an arcade was what the poet Milton had in mind when he wrote of—

A pillar's shade,
High over-arch'd, and echoing walks between.

Often, however, the wall is built up close to the columns, so that the arcade is in reality only a decorative screen. This form is known



ARCADE

A style adopted by the Moors.

variously as a *blind arcade*, *wall arcade*, or *arcature*. Arcades are also used in the interiors of churches for ornamental railings and similar purposes. Covered passageways lined with shops are known as arcades, but this use of the term is not technically correct.

The arcade was first used by the Romans, and it appears frequently in their aqueducts, palaces, and theaters. The great Colosseum at Rome has three arcades, one above another; in the famous Palace of the Doges at Venice both the lower and second stories are arcaded, as is also the interior court. The Leaning Tower of Pisa has six stories of arcades.

The arcade was a favorite architectural form of the Saracens. It appears in their mosques in Cairo, and when the Moors came to Spain they introduced it there. Among the most beautiful arcades are those which, resting on white marble pillars, surround the Court of the Lions in the Alhambra at Granada, Spain.

Related Subjects. The reader is referred to the following collateral articles:

Alhambra	Doge
Colosseum	Pisa

ARCADIA, in ancient Greece, the central and most mountainous part of the Peloponnesus, whose inhabitants were largely a shepherd people. They were famed throughout Greece for the simplicity and innocence of their character and manners, and for that reason the name *Arcadia* came to be used the world over as a symbol of rural simplicity and happiness. [See map, page 348.]

In Literature. In every country, especially at

times when life has been most complex and artificial, poets and prose writers have delighted to write tales of a fanciful Arcadia, where charming shepherdesses and brave shepherds spend their life in unbroken peace and happiness. Of these romances, the *Arcadia* of Sir Philip Sidney is perhaps the most famous.

ARCADIUS, *ahr ka' di us*, first of the Byzantine emperors. See **BYZANTINE EMPIRE**.

AR'CATURE. See **ARCADE**.

ARCH, an architectural form that combines grace and beauty with strength and utility. It has no support on the sides or top, but by reason of the perfect balance of its parts, through which they are mutually supporting, it is able to bear the weight of a load over an open space, as in doorways, windows, roofs, bridges, or tunnels.

Arches are made of stone, brick, wood, and steel, but the wooden arch is little used in building at the present time. The most common form of the arch is that of a bow, but



some are pointed, and there are a great many modifications of both the round and the pointed arch. The illustrations show the various parts and types.

The typical arch is composed of of wedge-shaped pieces called *voussoirs*, *ring-stones*, or *arch-stones*,

the middle stone being the *keystone* and the lowest stone on either side the *skewback*, or *springer*. The highest part is called the *crown*; the sides, *haunches*; the curve on the inner side, the *intrados*; the outer curve, the *extrados*. The base which supports the lowest stone on each side is the *impost*; in the illustration it consists of



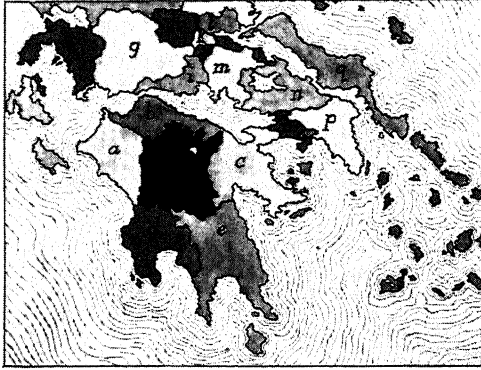
Photos: U & U

OLD AND NEW TYPES

Above: Old Moorish summer palace at Granada, Spain. Below: A new arcade in Santa Barbara, Calif., constructed after the earthquake of 1925.

bricks. The distance between the two supports of an arch at its lower part is its *span*; the *rise* is the height from the bottom of the haunches to the under side of the keystone.

A single stone, called a *lintel*, constituted the oldest and simplest device employed in supporting a structure over a doorway. The ancient Egyptians, Assyrians, Etruscans, and Greeks found the lintel practically sufficient for their needs; though they understood the principle of the arch, only the Etruscans used



ARCADIA (IN BLACK)

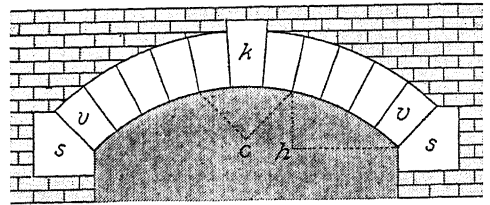
Surrounding provinces were as follows:

- | | |
|---------------|-------------|
| (a) Elis | (j) Doris |
| (b) Achaea | (k) Oetaea |
| (c) Argolis | (l) Malis |
| (d) Messenia | (m) Phocis |
| (e) Laconia | (n) Boeotia |
| (f) Acarnania | (o) Megaris |
| (g) Aetolia | (p) Attica |
| (h) Aeniania | (q) Euboea |
| (i) Locris | |

it to any extent. The Romans, however, utilized it constantly in their buildings, aqueducts, drains, and bridges. In modern bridge

construction, too, the arch has a very important place [see BRIDGE (Arch Bridges)].

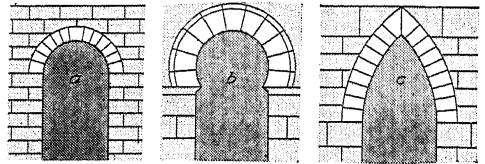
Arches for purposes of decoration are frequently seen. In public celebrations flower-



DETAILS OF THE ARCH

The various parts are described in the text. In the drawing, the terms are represented by their initial letters.

covered arches often span the streets; single arches are sometimes erected for gateways or as memorials. The *triumphal arch* of the



THREE TYPES OF ARCH

(a) Semi-circular. (b) Horseshoe. (c) Lancet.

Romans, under which a victorious general led his army, is of historic fame.

Related Subjects. The reader will find descriptions of famous triumphal arches under the following titles:

Arch of Triumph
Constantine

Titus
Trajan



A RCHAEOLOGY, *ahr ke ol' o jie*. In the rocks and fossils, hidden in the breast of Mother Earth, scientists are reading the story of how our world came to be. That is geology. Another reading is going on, no less absorbing. In the ruins of buried cities, in tools and pottery found deep in the earth, in the excavations of tombs and temples, men are reading a fascinating story of the growth of ancient civilizations. History and legend, art and modes of living, manners and customs are being revealed as the long-hidden records of the past are uncovered. That is archaeology.

However, men do not agree on the practical

meaning of the term *archaeology*, in spite of the fact that it means literally the *study of antiquities*. Some say that the word covers the whole history of men and nations. Others refuse to admit this almost limitless scope, and apply the word only to the material remains—inscriptions, architecture, pottery, tools, etc.—of the nations and peoples now extinct. Sometimes, the word *archaeology* is limited to the study of the historic peoples of antiquity—for example, the Greeks and Romans—whose careers we can trace from written words; in this case, the study of the relics of prehistoric men is distinguished by the designation *prehistoric archaeology*.

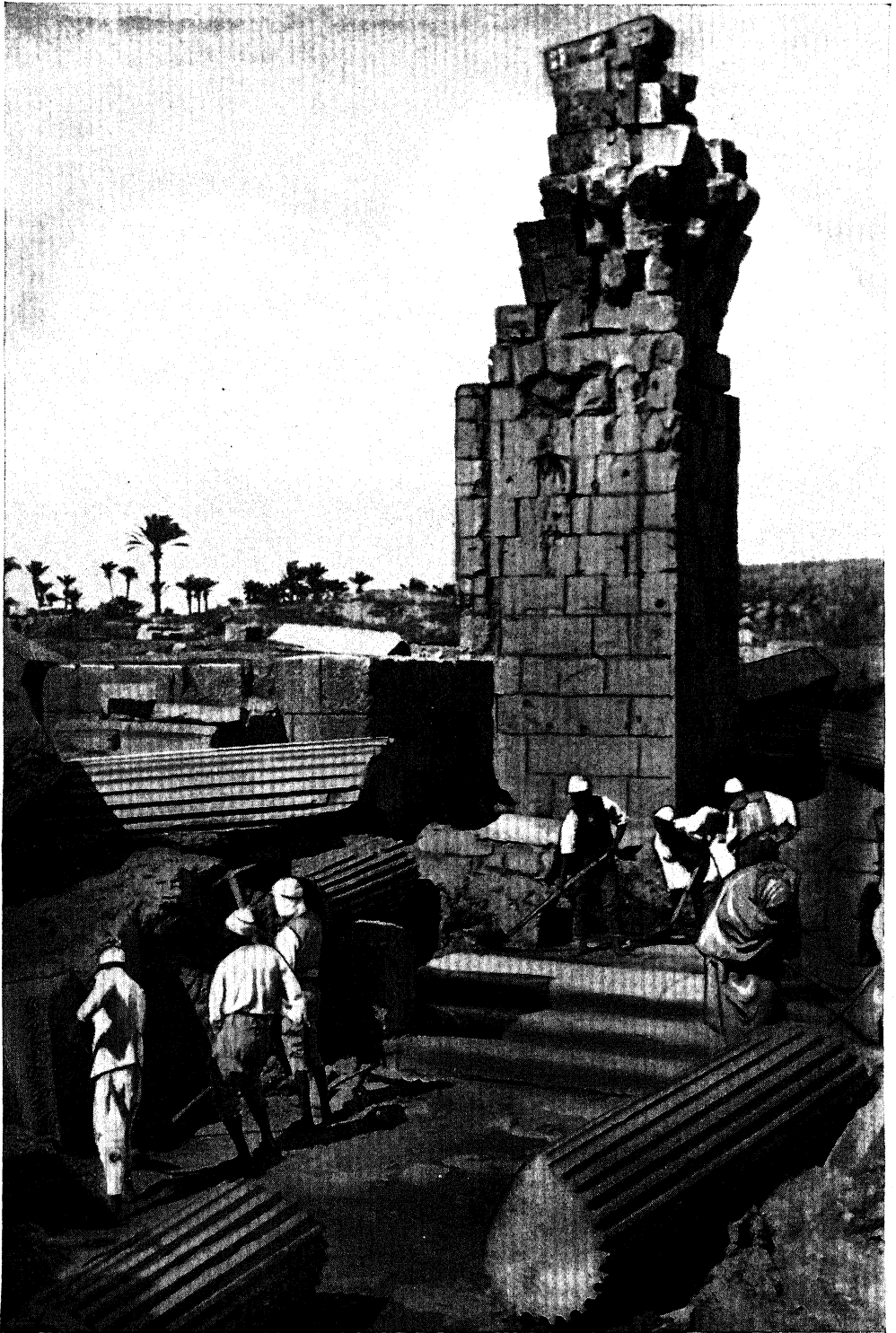


Photo: Wide World

In Old Leptis Magna. Remains of an ancient Roman civilization in Tripoli, North Africa. Here are shown fallen columns of a triumphal arch; under it marched the victorious legions of Emperor Septimius Severus.

General archaeology usually means the second application given above—the study of extinct nations or peoples by means of the relics which a changing world has at least partially preserved. The story of geology to be read in rocks and fossils tells us of the many changes which have altered the surface of the world, even in times recent enough to include man's development. Floods and volcanic ash have covered once populous areas. Earthquakes have shaken cities and villages to dust and oblivion, and the accumulations of centuries have buried them far below the earth's surface. Glaciers once crept over con-

tinents, and covered the remains of the men and animals that were forced to retreat before the great ice sheets.

Men are striving patiently to push back the horizons of our knowledge, beyond the limits of written history, beyond tradition, beyond these natural changes which have overwhelmed men and cities, beyond primitive man, to the very beginnings of human life in the world. As little by little they are regaining this lost knowledge, they are reconstructing man's activities on the earth into a huge mosaic, put together a fragment or small section at a time. A piece of pottery here, a tablet there, the forgotten ruins of a city, all contribute to a completed whole. (Sometimes a whole buried city may prove of less value to archaeology than a small piece of pottery, provided that the pottery supplies a missing bit of important knowledge, while the city only serves to elaborate facts which are already certain.) Because most of the relics which archaeologists seek are hidden in the earth, their work becomes a search for the buried treasures of knowledge, and gives them the name of "pick and shovel historians."

Many other sciences lend their knowledge to the archaeologist. Anthropology helps him to determine the racial and physical characteristics of the skeleton he finds in the earth;

geology determines the age of the earth in which he finds the "treasures," and therefore their own age. Written and traditional history helps in the analysis of ancient discoveries. So does the study of languages. In turn, archaeology becomes a part of and an aid to

each of these other sciences, and its result is a part of the great body of the history of man and the earth.

Men have given their lives to the study of a single department of this science of archaeology. A few pages devoted to the whole subject, therefore, cannot hope even to touch all the fascinating knowledge which is available. Furthermore, discov-

eries are being made continuously; they are part of the day's news. It is impossible, except by constant reference to newspapers and magazines, to keep up with this progressive science. The history of each country mentioned in these volumes discusses the first inhabitants of the region; other articles listed at the end of this discussion lead further into the study of our common ancestors.

The Development of Archaeology. The interest in the revival of Roman and Greek art and literature occasioned by the Renaissance (which see) might be set as the beginning of archaeology, although certainly there was nothing scientific about the study. For centuries afterward, there were a few attempts at organized collecting, and a few descriptions of relics, particularly old coins, were published. Ancient tombs were plundered, and their treasures were carried off, with no idea of cataloging them for future study. Societies for the study of antiquities were organized in the latter part of the eighteenth century in Italy, in London, and in Scotland. An important event in this early period, and one which gave a great impetus to Eastern archaeological studies, was the discovery and decipherment of the Rosetta Stone. The excavation of Pompeii and Herculaneum was begun in this period, also, but was of little

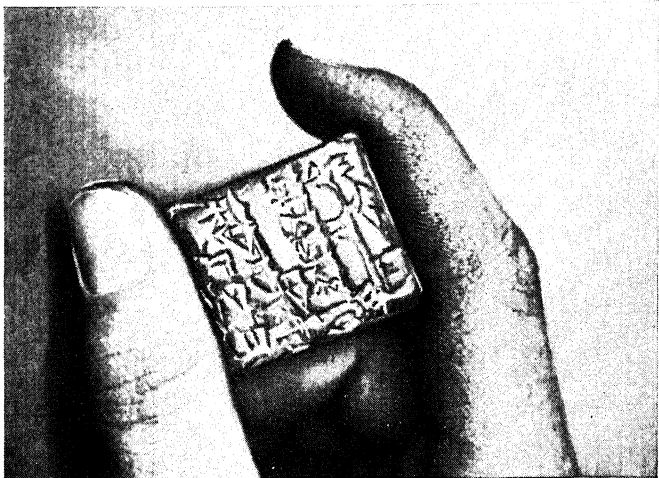


Photo: U & U

A BUTCHER BILL FROM UR

A tiny bit of baked clay, small enough to be held easily between finger and thumb, is possessed by the University of Pennsylvania. It is a butcher bill for three lambs delivered to the Temple of the ancient city of Ur, the forerunner of Babylon, and is believed to have existed since about 2350 B.C.

value to a chronological record. There was small hope of placing a relic as to time, unless there was a date or inscription upon it.

Meanwhile, men had been finding fragments of crude pottery, human bones, stone, and metal implements which would not fit into the known history of any nation. Usually these were found quite by accident, in stream beds, gravel deposits, or in well excavations. Men gradually concluded that these were relics of prehistoric inhabitants.

In 1830, C. J. Thomsen, a Danish scientist, faced the task of arranging a collection of prehistoric specimens for the national museum in Copenhagen. The classification he worked out there has been used essentially by all later archaeologists. Grouping crude and finished implements of one material, comparing those of different materials, he came to the conclusion that in one region the inhabitants, in primitive times, had used wood and stone, then had progressed from the use of crude stone implements to carefully finished ones, from stone to bronze, and from bronze to the more useful iron. Each of these stages had come slowly, and had lingered for thousands of years before the succeeding culture had established itself.

Other scientists reached the same conclusion. Thomsen's associate, Worsaae, excavated a Danish peat bog, finding there successive strata of material which perfectly supported Thomsen's theory. In the deepest layers were evidences of man's presence, with crude stone implements. Above those layers came bronze implements and utensils; above the bronze, and closest to the surface, were the iron relics. The conclusion was further verified by the vegetative remains in each stratum, which varied enough to show that different climatic conditions had existed, and that long spaces of time had intervened between the deposits. In 1854, another scientist, Keller, found the same stratification on the floor of the Swiss lakes (see LAKE DWELLINGS).

The theory has been confirmed again and again, until the conclusions reached are now accepted in their larger aspects without question. Men believe that these stages were common to all mankind—that every people has gone, or is going, through these stages on its way toward higher civilizations. These cultures, which were called the Stone Age, the Bronze Age, and the Iron Age, are described, each under its own title, in these volumes. Those articles make clear the fact that the term "age" does not indicate time; it refers to a stage of culture, which came at different times in different parts of the world. For example, some of the nations or tribes of Asia and Africa were using bronze and iron long before the European men advanced beyond the Stone Age. In some few places to-day—

among Eskimo tribes and in some of the South Sea Islands—the Stone Age is lingering on, for while the natives are in some cases acquainted with metal, they use bone and rock to fashion their chief implements.

Organized Excavation. Archaeology is, properly speaking, a new science, for organized searches for antiquities began less than a hundred years ago. The first excavation made on a site which had been dry land for centuries was that of ancient Troy; the work, proved that the place had been the site of many cities, built one above another at long intervals. The Roman Forum was partly uncovered, and in 1875 the Imperial German government began the first large-scale excavation at Olympia (which see). These works, and others carried on by the French government, were the first instances of government protection of relics; up to that time, they had been carried off by the excavators or by thieves, and all possibility of studying or placing them historically had been ignored. Registration and protection of relics is now practically universal. There is also a growing tendency to leave the archaeological treasures in their original setting, provided protection can be maintained, instead of sending them to foreign museums. This tendency has been aided by photography and new preservative processes, which make it possible for pictures and casts of the original article to be kept and studied in several different places.

While interest was first confined chiefly to Roman and Greek excavation, it has since been realized that every region of the world inhabited by man may be a site for archaeological research. Accordingly, aided by the work of local scientists and societies, archaeological surveys are now commonly made to map the remains of a whole region. Egypt, Europe, and India have occasioned many local and regional surveys.

The Use of the Airplane. A photograph from an airplane will sometimes show irregularities of the earth's surface which are so gradual as to be unnoticed from the ground. When prehistoric remains beneath the surface are to be located, an aerial photograph (particularly at morning or evening, when shadows are long) will frequently show the outlines of a buried earthwork, fortification, or village whose evidences, to an observer on the ground, are too slight to be noticed. Except for some unimportant attempts at surveys from a balloon, this aid to research was not used before the World War; although it has been of considerable aid, it is still in the experimental stage. One of its chief advantages to the archaeologist is the fact that he can save time that would be spent in fruitless excavation if he did not know exactly where to begin his work.

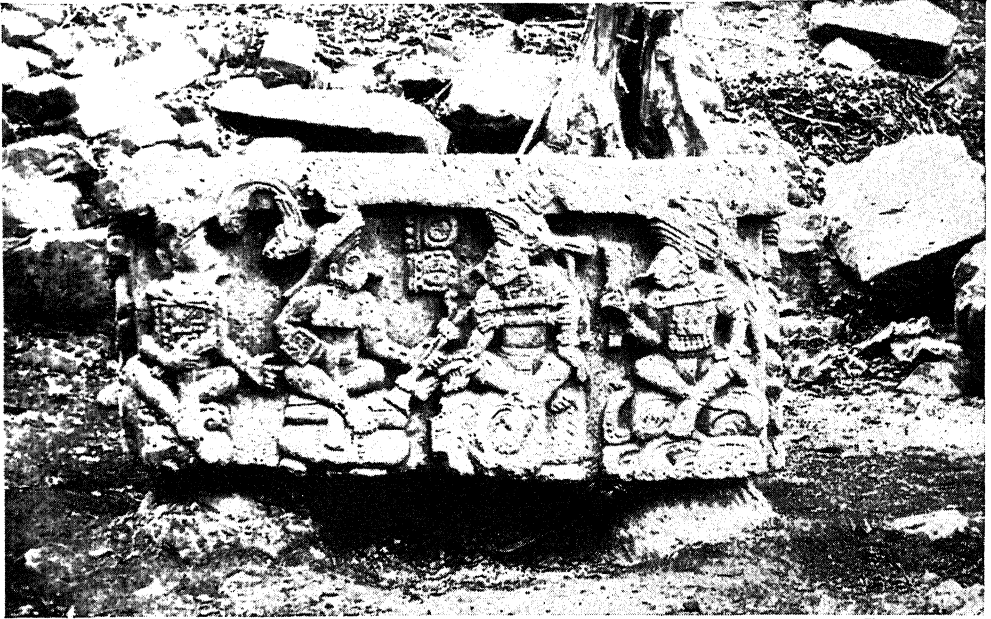


Photo: Wide World

AS ANCIENT AS OLD EGYPT

Archaeological discoveries in Central America prove that a high state of civilization prevailed there three thousand years ago. The carving pictured above was unearthed during 1924; it represents an astronomical congress in session, and bears a date which seems to correspond to September 2, A. D. 503. Another stone four miles distant and in a straight line from the one shown above discloses a date corresponding to August 13, 613 B. C. This is the earliest date in history on the continent, so far as is known.

Accomplishments of the Science. To describe here either the archaeological "finds" of the various countries, or what has been reconstructed of history from these discoveries, would be impossible. Some of the outstanding archaeological events of the various regions of the world, together with the most recent discoveries, are given below. A survey which is completely up-to-date can only be made by frequent reference to the news agencies which record the discoveries being made. The whole subject, or particular departments, can be studied with profit and great interest through these records of modern discoveries and through the beautifully illustrated volumes which have been published in this field.

Europe. Exploration of Northern and Western Europe and Great Britain has uncovered a prehistoric culture too extensive to discuss here. However, the existence of man in Europe in the Tertiary Period has recently been demonstrated to the satisfaction of many archaeologists by research near Ipswich, England, which revealed flint implements; the existence of primitive man at that period has been a matter of much debate.

Among the remains of *paleolithic*, or Old Stone Age, culture, there are none so interesting as the drawings found on walls and ceilings of caves in France and Spain. There are pictures of reindeer, mammoth, bison, and deer, some-

times crude, sometimes done with a beautiful delicacy. Some are engraved only; others are colored with clay pigments. It is believed that these were not random sketches, but had a magical and ceremonial purpose.

Knowledge of prehistoric man is further advanced by the investigation of *kitchen middens*, the *lake dwellings* of Switzerland and England, and Stonehenge in England, all of which are described in these volumes. Relics of the New Stone Age, or *neolithic* civilization, have been found in most of the countries of Europe.

Greece. Excavations in Greece in the eighteenth century disclosed the famous Venus de Milo, the Zeus temple at Olympia, and the Athene temple at Aegina. Systematic diggings begun nearly a century later disclosed the site of ancient Troy, built above the ruins of several other Troys, and work then conducted at Mycenae and Tiryns uncovered the old Greek civilization known as the Mycenaean. Excavations made since then at such historic places as Athens, Delphi, Sparta, and Corinth have revealed further interesting facts about the Mycenaean period, which extended from about 1450 B.C. to about 1200 B.C.

Relics found in the island of Crete, however, tell of a civilization which existed before the Mycenaean. It is known as the Aegean, and probably existed as early as 4000 B.C. Relics found still deeper in the earth show

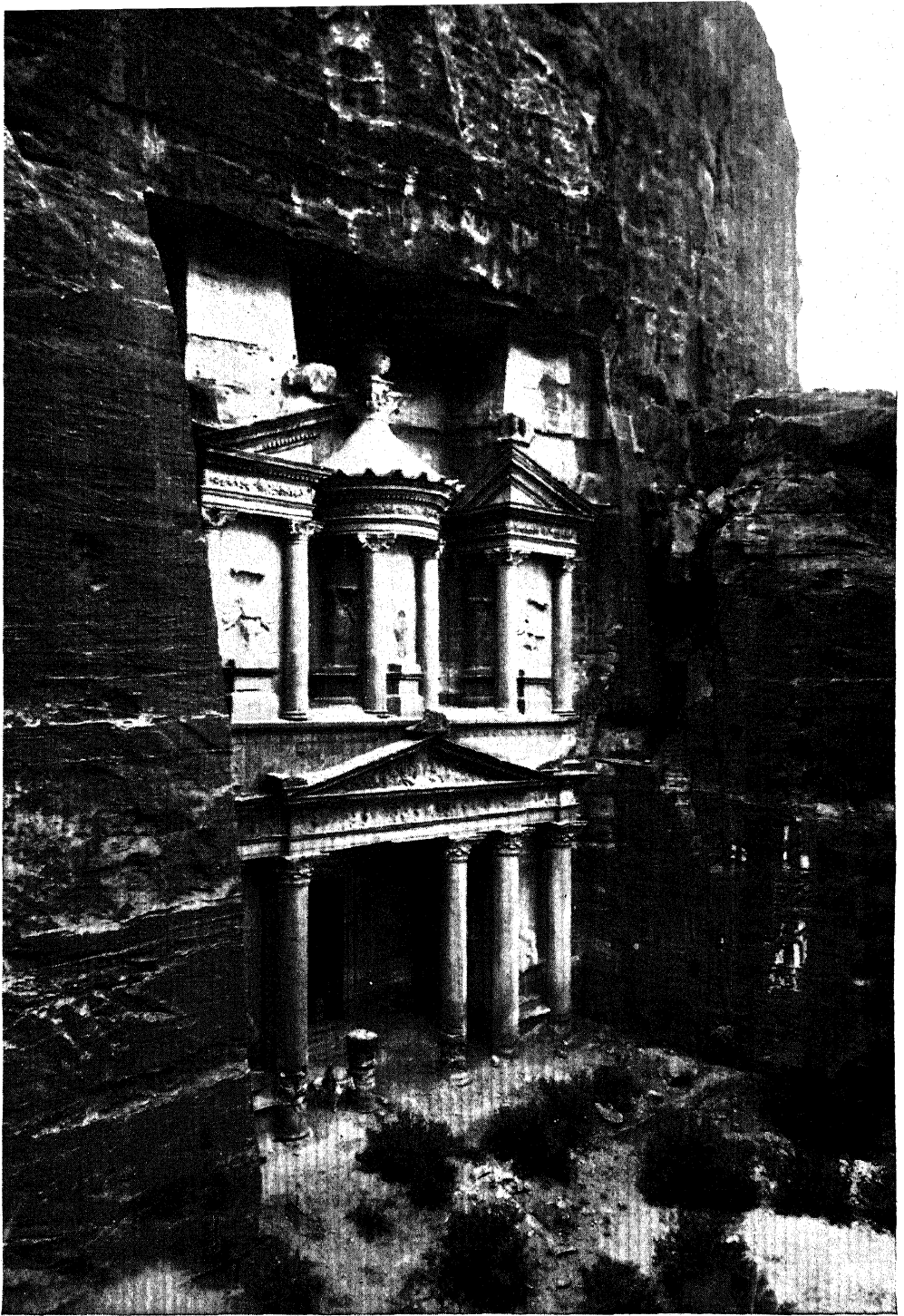


Photo: U & U

Petra's Architectural Marvel. The Temple of Isis (The Treasury), an impressive example of the building ingenuity of ancient people who hewed their buildings in rocks. Their art has withstood the ravages of time.

Petra is a Greek name for Zur, or Gur (see *II Chron.* xxvi, 7; *Num.* xxxi, 8).

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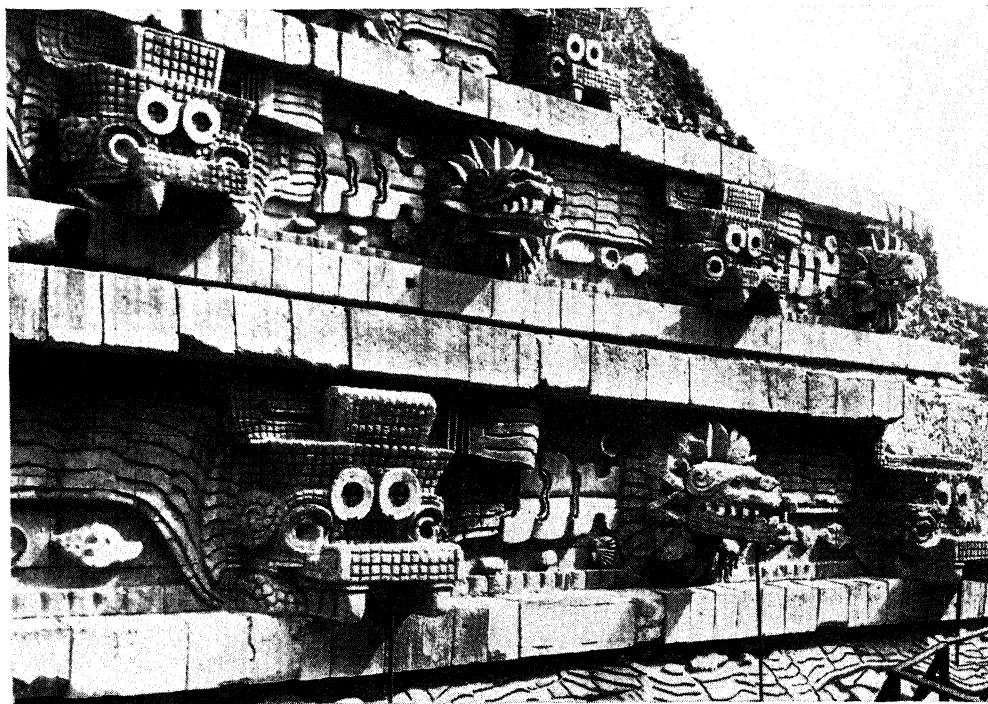


Photo: U & U

PYRAMIDS OF THE WESTERN WORLD

In Teotihuacan, Mexico, are pyramids dating back to an era preceding the conquest of the country by Cortez. They have given Mexico the name, among archaeologists, of "the Egypt of America."

that a race of people must have lived in that country about 10,000 years before the birth of Christ; findings at Cnossus in Crete (which see), at Athens, at Troy, and at other ancient cities have indicated the presence of a neolithic, or New Stone Age, civilization which lingered in each center of population until bronze was introduced.

Italy. Originally, excavations in Italy were for the purpose of obtaining stone for building, but such diggings gave to the world those wonderful art treasures, the Apollo Belvedere and the Laocoön group, both of which are described in these volumes. The earliest organized excavations, mentioned above, were begun at Herculaneum and Pompeii, those two early victims of the fire-spitting Vesuvius. This work is still going on; new structures and new works of art are coming to light to build the story of life in those ancient cities.

Excavations at Rome have uncovered the chief temple of the city, part of the Augustan Forum, the Imperial Palace on the Palatine Hill, the palace of Nero, and many works of art; all of this activity has taken place in comparatively recent years.

The history of the culture of the Etruscans, from their entrance into Italy up to Roman times, is being gradually reconstructed from the excavation of Etruscan cities, but the

origin of these people remains a mystery. Prehistoric archaeology, extending from neolithic to historic times, has been carefully traced in Italy.

Egypt and Asia Minor. Several factors have combined to make Egypt one of the richest fields in the world for the "pick and shovel historians." The ancient civilizations flourished while European man was still in a primitive state. The relics of these civilizations have been hidden beneath the desert sands, whose shifting waves have kept the treasures at least partly hidden from thieves. The dryness of the sand and of the air has preserved the relics so perfectly that explorers describe tombs thousands of years old as untouched by the passage of time as if they had been closed yesterday—gleaming, untarnished gold, furniture, and exquisite art treasures free even from dust. Such discoveries are now rare, for most of the tombs have either been plundered by thieves, or explored by excavators. The great pyramids and the Great Sphinx, from whose gigantic paws the desert sands have recently been cleared away, are relics of ancient Egypt which are familiar to everyone. In 1914, one of the oldest tombs of the land was discovered, the mystic tomb of Osiris. In that country valuable bits of manuscript were discovered by the English, among them

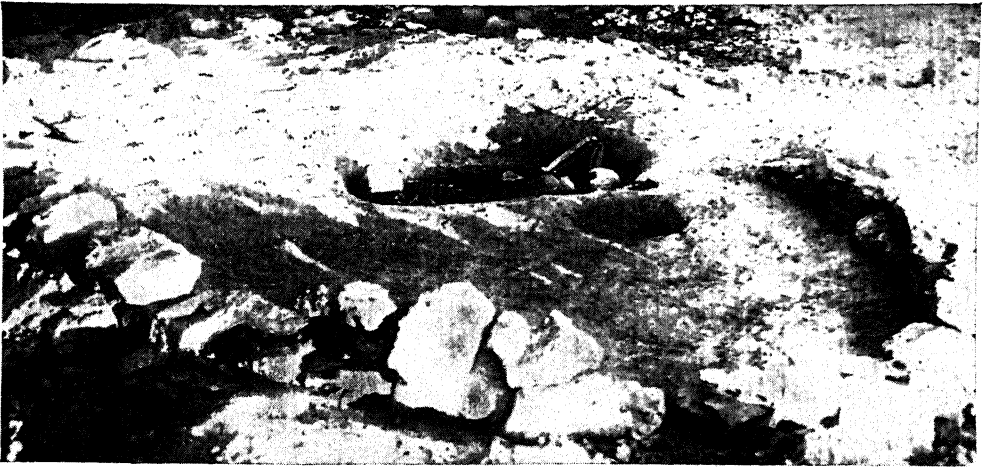


Photo: U & U

THE OLDEST KNOWN GRAVE IN AMERICA

A skeleton and two pieces of ancient pottery unearthed in the pre-Pueblo ruins in Nevada.

about ten pages from the *Idyls* of Theocritus. Two rolls of manuscript by the poetess Sappho were also found. The discovery of a burial ground about two hours away from Cairo by rail revealed some 1,500 graves, from which many interesting facts concerning the life of the Egyptians were gleaned. One of the most thrilling of archaeological discoveries was the opening of the tomb of King Tutankhamen in 1923—not so much for its part in reconstructing Egyptian history as for the objects it held which reveal the customs and modes of living of the period.

An Egyptologist, Sir W. M. Flinders Petrie, has devoted his life to painstaking study and excavation in this country, and has made our knowledge of the prehistoric world of Egypt fairly certain. He believes that the oldest inhabitants were allied to the Southern European races, and had developed a high neolithic civilization by 5000 B.C. They were conquered by a more civilized race, probably from Arabia, who developed the use of metal and a system of writing.

In the regions of Babylonia and Assyria occurred, so far as is known, the first great city communities, where the people had organized government and religion, and carried on extensive agriculture by irrigation. American explorers at the ancient ruins of Nippur have placed the date of their finds as 8000 B.C.; although this is disputed, the city was certainly one of the first in that country.

Since 1922, a joint British and American expedition has been excavating at the ancient city of Kish, modernly called Tell El-Ohemer. The origin of the Sumerians, round-headed, non-Semitic people who were the first inhabitants of Babylonia, has not been discovered, but extensive temple ruins, towers, pottery,

and even cosmetic aids of the period have been found, which help to reconstruct the life and customs. Earlier ruins are being explored which may solve the mystery of Sumerian origins; discoveries indicate that they reached Mesopotamia from the north or northeast.

The excavation of Biblical sites, either in Europe or in Asia Minor, has always attracted so much interest that there is a branch of the science known as *Christian archaeology*. For many years, the attitude of the governments of these ancient countries made exploration difficult, but in recent years it has been more extensive. The ancestral home of Abraham, Ur of the Chaldees, is being uncovered by British and American agencies. Tablets discovered in Palestine and Syria tell of the Flood, of the kings Sennacherib and Nebuchadnezzar; others describe the lives and customs of the Canaanites and Israelites.

Recent discoveries at Tell Beit Mirsini, known in Biblical times as Kirjath Sepher, forty-two miles from Jerusalem, are said to fix the date of the Hebrew Exodus from Egypt at 1275 B.C., and give a history of the Canaanites and Israelites from 2000 B.C. to 600 B.C. The chief results of Syrian excavation have been to bring to light knowledge of the Hittites.

America. The origin of the first inhabitants of North America is unknown. However, traces of the prehistoric inhabitants have been found which indicate that in this "New World" were human beings at the time of the Glacial Epoch. Excavations among heaps of ancient refuse, or the *kitchen middens*, along the Pacific coast, in the Delaware River Valley, and in Florida, have indicated this. The earthworks, burial places, and other prehistoric mounds which are found in various places in North America are described in the

article MOUND BUILDERS, while probably the most interesting record of a prehistoric people is that of the Cliff Dwellers. An ancient Indian pueblo, believed to be 2,000 years old, was unearthed in 1925 in Nevada.

In Central America, the Maya civilization, which flourished before the Spanish conquest, is the subject of continued investigation, while the Aztecs of Mexico are subjects of historical as well as of archaeological study.

Asia. The conviction that Central Asia is the original home of mankind has aroused interest in its exploration, but the hardships and dangers of the region have deterred all but a few expeditions. The American Museum of Natural History, associated with the Field Museum of Chicago, has sent several expeditions into the Gobi Desert of Mongolia, where fossils and relics have been found which contribute important evidence as to the evolution of the mammals. See MONGOLIA.

Africa. Archaeologically, Egypt is usually considered separately from Western and Southern Africa, where there has been comparatively little investigation. Skulls and relics showing the transition between the Old and New Stone ages have been discovered in Uganda, and prehistoric remains have been unearthed in other parts. The northern coast of Africa was, of course, colonized by Rome, and the cities of Timgad and Leptis Magna, the latter uncovered in 1925, are examples of well-preserved Roman towns.

Recent Discoveries. Since the opening of Tutankhamen's tomb, there has been no discovery which has attracted such universal interest. Progress has been steady, however, and some of the recent activities are listed below.

In 1929 Col. Charles A. Lindbergh in a flight over Yucatan found the location of pyramids and royal tombs of the Aztecs, theretofore unknown.

Near Cologne, Germany, the Roman naval port of the first century A.D., headquarters for the fleet that controlled the Rhine, has been discovered.

The Palestine Expedition of the University of Pennsylvania has excavated two new temples at Beisan; a gift of two million dollars has been given by J. D. Rockefeller, Jr., for a museum of Palestine antiquities at Jerusalem; record of previously unknown kings who ruled 5,000 years ago was discovered by the University of Pennsylvania Museum and the British Museum expedition at Ur of the Chaldees.

The Captain Marshall Field Expedition to British Honduras returned to the United States in 1928 with 300 objects, representative of ancient Maya culture, found while excavating three buried cities. A sculptured Maya altar stone is the most valuable find, because it is the only relic with a legible date inscription ever brought to the United States. The Maya hieroglyphics indicate a date on their calendar which would correspond to A.D. 575.

In America, investigation is progressing on ruins which indicate a culture bridging the gap between

the pueblo culture of the Southwest and the civilization of the Aztecs and Mayas.

Further evidence of the existence of man in North America during the Glacial Epoch has been indicated by bones of extinct animals and stone implements found in Oklahoma, Texas, and New Mexico. B.L.

Related Subjects. Supplementary information in the broad field of archaeology may be found in many articles in the WORLD BOOK, among them the topics listed below:

Age	Iron Age
Apollo (Belvedere)	Kitchen Middens
Assyria	Lake Dwellings
Athens	Laocoön
Aztec	Maya
Babylonia	Mongolia
Bronze Age	Mound Builders
Cave Dwellers	Petrie, William M. Flinders
Cliff Dwellers	Pompeii
Corinth	Rome
Crete	Rosetta Stone
Delphi	Sparta
Etruria	Stone Age
Forum	Stonehenge
Geology	Troy
Glacial Epoch	Tutankhamen
Herculaneum	Venus de Milo

ARCHANGEL, *ahrk' ayn jel*, a name meaning *chief angel*. As used in the New Testament, the word indicates that there are ranks among the angels. Saint Paul refers to the Lord as an archangel (*I Thes. iv, 13*). Jude refers to the archangel Michael. While Gabriel is nowhere directly called an archangel, he is considered chief among the angels. In *Revelation* there are various references which indicate that there are angels of different rank. See ANGEL.

ARCHANGEL. See RUSSIA (Principal Cities).

ARCHBALD, ROBERT W. See IMPEACHMENT.

ARCHBISHOP, the chief prelate or bishop of an ecclesiastical province, or *see*, who has jurisdiction over all bishops in that province. The title was first used in the fourth century, to distinguish the bishops in large cities from those of smaller churches; the office is recognized in the Roman Catholic, Anglican, and, Greek churches. In the Roman Catholic Church, the archbishop of Rome is the Pope; he has the power to appoint other archbishops, who must previously have been bishops. England has two archbishops, one at Canterbury and the other at York, of whom the former is supreme; these are the highest prelates in the Church of England. The archbishop of Canterbury officiates at the coronation of the kings or queens of Great Britain. The Roman Catholic is the only Church maintaining the office of archbishop in the United States, which is divided into fifteen provinces, or *sees*, with an archbishop over each. See BISHOP; ROMAN CATHOLIC CHURCH; CHURCH OF ENGLAND.

ARCHEAN, ahr ke' an, SYSTEM. See ARCHEOZOIC ERA.

ARCHEOZOIC, *ahr' ke o zo' ik*, **ERA**, the earliest of the great eras into which geologic time has been divided. The name, derived from the Greek, means *pertaining to very ancient life*. In the usage adopted by the

United States Geological Survey, the rocks, of whatever origin, formed during the era constitute the *Archean System*. Most geologists believe that in the earliest geologic times the earth's surface consisted only of igneous rocks. After an atmosphere had formed, and the earth was subjected to the action of rain and wind, the surface rocks were eroded, and the first sediments were laid down. As time went on, both the igneous and the sedimentary rocks were tremendously deformed and meta-

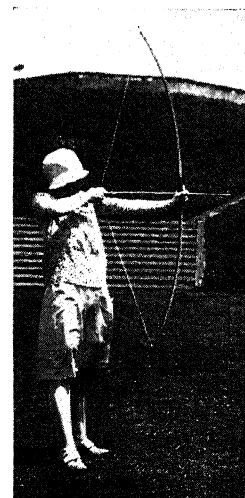


Photo: U & U

THE ARCHER

morphosed, so that no Archean rocks have remained in their original condition.

The Archean System consists of a great assemblage of metamorphosed igneous and sedimentary rocks having an extremely complex arrangement and underlying at greater or less depth probably all the land surface of the globe. Archean rocks are found in many parts of North America, especially in the Granite Gorge of the Grand Canyon of the Colorado, in the region about Lake Superior, in the Appalachian region, and in a vast area about Hudson Bay. Because the rocks include graphite and limestone, it is inferred that life then existed, for those rocks are not known to be formed except through the agency of plants and animals. No fossils are preserved, and it is supposed that the plant life consisted of algae and bacteria, and the animal life of protozoans and other soft-bodied animals of minute size. See GEOLOGY; PROTEROZOIC ERA; IGNEOUS ROCKS.

L.LaF.

ARCHER, THE. See SAGITTARIUS.

ARCHERY. From the earliest period of recorded history, until gunpowder gave man a new kind of weapon, the bow and arrow formed the chief instrument of war and the chase. One of the earliest Bible narratives is that of Ishmael, who "dwelt in the wilderness of Paran and became an archer" (*Genesis* **xxi**, 20). The Egyptians, Persians, Assyrians, and Parthians were all highly skilled in the use of the bow and arrow, the Parthians being the most celebrated horse-archers of ancient

times. Among European peoples none excelled the English in archery, and stories of the bow and arrow are numerous in their history, their legends, and their songs.

For centuries after the introduction of gunpowder, archery was practically unheard of, but it had a rebirth in the latter part of the eighteenth century, when fashionable Londoners took it up as a sport.

Targets. Modern archery is confined almost entirely to shooting at targets, which are made of straw or cork; official targets are four feet in diameter, and are painted with concentric rings. Each of these rings has a value in counting: the outer ring, white, counts 1, if the arrow enters it; the black, 3; the blue, 5; the red, 7; the center, or bull's eye, gold, 9. The skill which it requires, together with its characteristics of play, has made archery a popular and fashionable sport.

ARCHES NATIONAL MONUMENT. See MONUMENTS, NATIONAL.

ARCHIMEDEAN, *ahr ki me' de an*, **SCREW**, a device for raising water, said to have been invented by Archimedes. It consists of a hollow spiral tube bent around a cylinder, as shown in the illustration. The device is in-

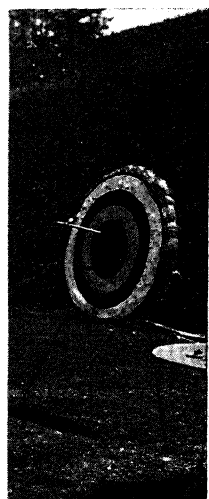
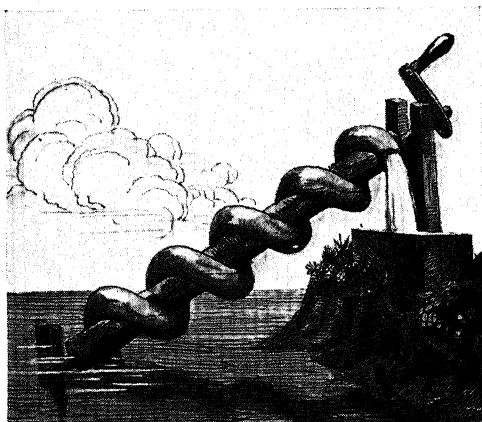


Photo: U & U

THE TARGET



ARCHIMEDEAN SCREW

clined, the lower end being immersed in the water; the upper end has a handle by which the apparatus may be turned. The water is gradually raised from one bend of the tube to the next and finally flows out of the upper

end. The Archimedean screw, in ancient times, was used in the Nile Valley for draining and irrigating land, and it is now sometimes employed where it is desired to raise a large quantity of water not more than ten or fifteen feet, with the expenditure of little power. See ARCHIMEDES.

ARCHIMEDES, *ahr ki me' deez* (287-212 B.C.). Among the treasures recovered from the ruins of Pompeii and Herculaneum is a mosaic picturing the death of Archimedes at the hands of a Roman soldier. Thus does modern archaeology verify a fine old tradition typifying the warfare between ignorance and the search for truth. Archimedes was slain while engaged in his mathematical studies in his native town of Syracuse. He had already accomplished



"DON'T DISTURB MY CIRCLES!"

enough to make his name immortal, for he is generally credited with the discovery of the principle of specific gravity. The story goes that Hiero, the king of Syracuse, was anxious to learn whether his crown was of pure gold; the matter disturbed him greatly, and he commanded Archimedes to seek out the answer to this question.

The mathematician found the problem a difficult one and discovered the solution by accident. One day while he was in the public bath, he noticed that the mass of his body made the water spill over the sides of the tub. The basic principle of this phenomenon then flashed into his mind: that a body displaces a quantity of water equal to its own bulk, and

that the loss in weight of the submerged body is equal to the weight of the water displaced. Forgetting everything in the joy of discovery, the philosopher leaped from the tub and ran home shouting, "Eureka!" (I have found it). He was then able to test the purity of Hiero's crown by comparing it, while it was immersed in water, with the same weight of pure gold immersed in the same amount of water. If the crown contained an alloy, it would cause more water to overflow the vessel.

Archimedes also discovered several principles of pure mathematics, and he made applications of geometry to the principles of the lever, the pulley, the screw, and other machines; he is said to have boasted that he could move the world if he had a place to stand on. Tradition credits him with the invention of the Archimedean screw, used in irrigation, and of burning glasses capable of firing ships. The siege of Syracuse by the Romans under Marcellus was prolonged three years because of various engines of war devised by Archimedes, and the story persists that his burning mirror set fire to the Roman fleet. During the sack of the city the old philosopher was disturbed in his study by a soldier with drawn spear. "Don't disturb my circles," cried the sage. Brutally, the soldier turned and thrust his spear through the old man's body.

The story has come down that Archimedes was killed while drawing circles in sand. The mosaic referred to above shows him seated in a chair studying an abacus, or counting board. It is an interesting bit of authentic history that Cicero, in 75 B.C., found the tomb of Archimedes while he was quaestor in Sicily. This tomb, erected by Marcellus as a token of his admiration for the illustrious scholar, who was killed in defiance of his orders, was marked with a sphere inscribed in a cylinder, honoring what Archimedes considered his greatest mathematical discovery.

Related Subjects. The reader is referred in these volumes to the following articles:

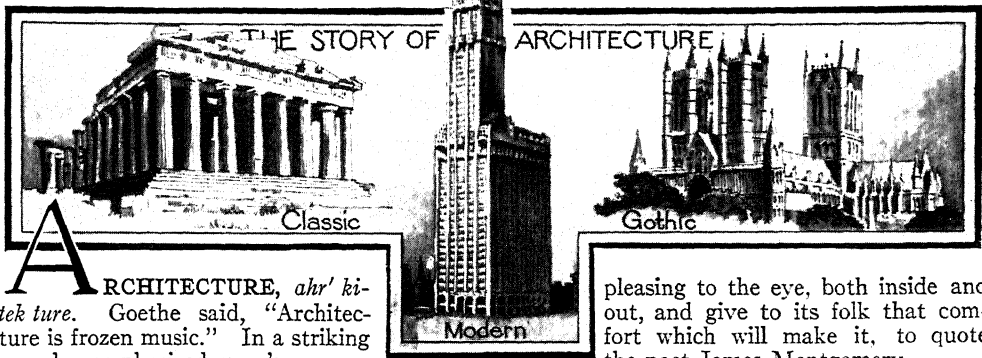
Archimedean Screw	Hydrostatics
Cylinder	Lever
Geometry	Mirror
Gravity, Specific	Syracuse

ARCHIMEDES' PRINCIPLE. See GRAVITY, SPECIFIC; HYDROSTATICS.

ARCHIPELAGO, *ahr ki pel' a go*, a word derived from two Greek words meaning *chief sea*, now given to any sea, or portion of a sea, containing a large number of islands. The name is generally applied to the islands themselves, but this is not strictly correct. The Aegean Sea (which see), between Greece and Asia Minor, is the most notable archipelago in the world; the name was first given to it by the Greeks, to distinguish it from all other seas.

R.H.W.

ARCHITECT, *ahr' ki tekt*. See BUILDING.



A RCHITECTURE, *ahr' ki-tek ture*. Goethe said, "Architecture is frozen music." In a striking way he emphasized man's accomplishment in making art walk hand in hand with unemotional science, which takes account only of endurance, utility, stress, and strain in the construction of a building. That brick and stone and marble may be so utilized that the realization of an architect's dream may stir the esthetic emotions is reason enough for placing architecture among the fine arts. It is therefore proper to class architects of vision with painters and sculptors. They all produce objects good to look at, and sometimes inspire a spiritual exaltation in the beholder.

Is a building well proportioned? Are the details of it pleasing to the eye, and does the structure as a whole seem to fit well in the landscape? Is its style suited to the purpose for which it was built; that is, if it is a schoolhouse, does it look like a schoolhouse and not like a barn with windows; or if it is a home, does it appear comfortable and inviting? These are the questions we ask ourselves when we see a building, and on our conclusions we are apt to base our opinion of the architect.

But if buildings were only beautiful, few could be well utilized. Usefulness, except in monuments and purely decorative structures such as arches of triumph, is even more essential than attractiveness. If an architect is to design an office building, he must know the relative cost of building with different materials and the expense of labor for each kind of work. More important still, he must understand how to arrange the space so that it will bring the greatest possible rent, must know how many elevators are needed to serve the people who will occupy the building, what type of heating equipment is most effective and economical, and how much window space is necessary to give proper light. He must be able to estimate exactly how much strength is required at each point, and know how to gain this strength with the least cost.

Houses. "Home," said Pliny, "is where the heart is." A home, then, more than any other structure, should be harmonious. It should be

pleasing to the eye, both inside and out, and give to its folk that comfort which will make it, to quote the poet James Montgomery—

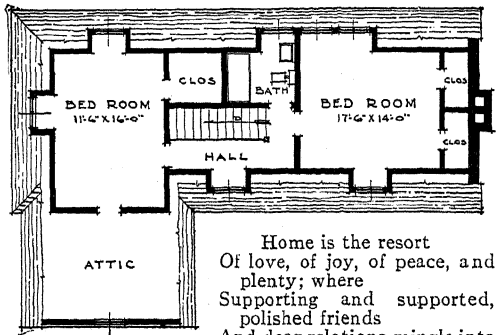
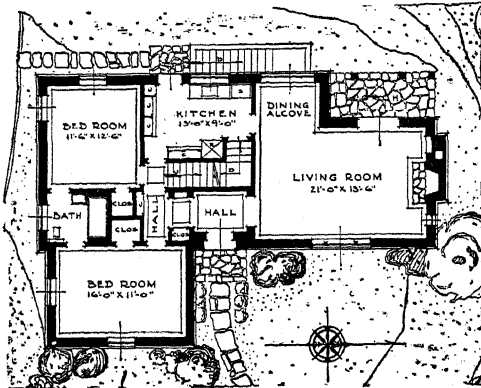
the spot of earth supremely blest,
A dearer, sweeter spot than all the rest.

Surely, then, there is no greater field for architecture than in home-building, and yet it is only within the last generation that the art and science of home-planning has developed. In earlier years, kings had their palaces designed by architects, and rich men imitated them; but splendor and magnificence were commonly sought, rather than true charm.

To build a home in this age without the aid of an architect is only a little wiser than to attempt to make one's own automobile. This does not mean that the architect is to be given an order for a house, and that the owners must accept whatever he chooses to give them. A home, to be enjoyed to the utmost, should be an expression of its owners' thought. Perhaps the master of the house would like his library arranged in just such a way, and the mistress is longing for a certain kind of kitchen and many closets for clothes and linen, and both have definite ideas about a porch, a fireplace, or a sun parlor, and many other details; but if they attempt unaided to combine their ideas in one structure they find the task most difficult. Or, perhaps they have admired certain houses which they have seen, but have no very exact notion of their wants. In either case, a good architect can soon find the way, if there is any, to embody the dreams of his clients, besides adding many conveniences which they never would have suggested. Thus he makes the whole structure quite unlike any other, a "thing of beauty," which, says Keats—

is a joy forever;
Its loveliness increases; it will never
Pass into nothingness.

The services of an architect are not beyond the purse of anyone who is building. Usually the fee for designing is only six per cent of the cost, and for supervising construction an additional four per cent. Thus one who plans to



Home is the resort
Of love, of joy, of peace, and
plenty; where
Supporting and supported,
polished friends
And dear relations mingle into
bliss.

THOMSON—*The Seasons.*

A VERY PLEASING DESIGN FOR A HOME

An architect's conception of a house that embodies the most modern ideas. Note that the dining room is abandoned in favor of the dining alcove, the theory being that dining-room space is unused for the greater part of the day and night and is not economical. [The above plans were drawn especially for *THE WORLD BOOK* by Conner & O'Connor, winners of first and third prizes in a national competition featuring small dwellings, sponsored by the *Chicago Tribune*.]

spend \$5,000 on a small home may have expert help for \$500, and if the architect is competent he will save more than this amount in construction costs.

Architecture Old and New. Most of us know, when we see a building, whether it pleases or displeases us, but few of us can tell why. To gain a true appreciation of cause and effect, a knowledge of what renders a structure attractive or makes it offend the eye, we must study the story of architecture. When we learn how men have gradually approached a knowledge of true beauty, we shall gain more of that knowledge for ourselves. In so doing, we shall add greatly to our enjoyment of good architecture, for our eyes will be opened to many beautiful things which we have never before noticed.

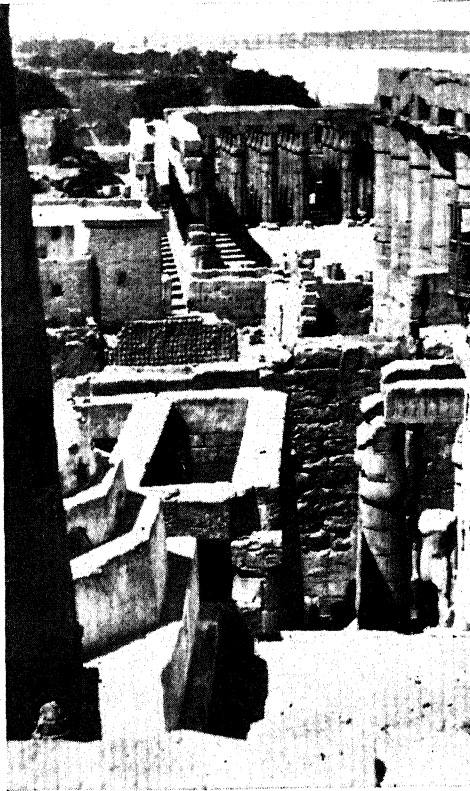
Early Efforts. It is in the cradles of civilization, Egypt, Assyria, and Babylonia, that we find the first successful attempts to give beauty to the work of the builder. The tombs and temples of ancient Egypt, some carved out of solid rock, others formed of massive blocks of stone, are silent testimonies to the aspirations of a race which believed in the endless life of the human body as well as of the soul. They have a dignity and an air of eternity unequaled by any other works of man. Both carving and color added to their charm, but the heavy walls and close grouping of columns, the flat roofs and the predominance of straight lines give them a depressing solemnity. All of these features will be appreciated after a study of the pictures of the ruins of Karnak which appear in the article *EGYPT*, and of the

illustration here shown of the Temple of Luxor. Many centuries before civilization in the Nile Valley reached its height, the Babylonians and Assyrians developed an architecture which resembled the Egyptian only in its straight lines, flat roofs, and massive walls. The Assyrians had little stone, the Babylonians none at all, and neither had timber. Sun-dried brick was their building material; with it they erected huge palaces, with walls often thirty feet thick and usually no farther apart, roofed with primitive vaults. The rooms were high-ceiled, long, and narrow. Windows were impossible in walls of such depth, so there could be no second story to shut off light from above. Decoration was gained with glazed tile, painting, and carving.

"The Glory That Was Greece." Of the many debts which architects of the last two thousand years owe to their fellows of ancient Hellas, and especially to those of the Age of Pericles (about 460-430 B.C.), none exceed the indebtedness felt for the sense of proportion the Greeks gave us. The Parthenon at Athens, inspiring even in ruins, is unequaled as an example of a building whose parts all bear a pleasing relation to one another and to the whole. Proportion is a matter which has no exact science; yet it is one of the most vital questions in architecture. If you were describing the Parthenon, you would not speak of it as a narrow building, nor as a wide building; you would not say it was high or low. Far more than mere adjustment of the three dimensions was necessary to gain this effect of perfection. Notice, for a single instance of the care which the builders exercised, that the three columns of each corner have less distance between them than have any of the others. But for this arrangement, the temple would appear distorted because of the contrast between the bright sky, forming the background at the edges, and the dark inner walls at the center.

Harsh, straight lines are avoided in Greek structures by the adoption of soft, almost imperceptible curves. Thus, the columns in the Parthenon do not taper like pails set upside down, but with a graceful, gradual change of direction.

Details characteristic of Greek public architecture were the low-pitched roofs of timber covered with



MAGNIFICENT DESOLATION

The deserted Temple of Luxor, Egypt, looking southwest from the first pylon. The photograph is reproduced in two halftones combined, to show general appearance to-day and a close view of a characteristic column. (See *THEBES*, in these volumes.)



Photo: U & U

tile, the terraced steps, the sculptured friezes. Red and blue paint, gold and dull yellow wax, gave warmth to the cold, white stone. The three types of column—Doric, Ionic, and Corinthian—are described and illustrated in the article *COLUMN*, and each of three famous buildings, the Erechtheum, Theseum, and Parthenon, is treated in a separate article.

"The Grandeur That Was Rome." Before the rise of the imperial city on the banks of the Tiber, the Etruscans, whose home was farther north in Italy, had become expert in the use of the arch. From them the Romans

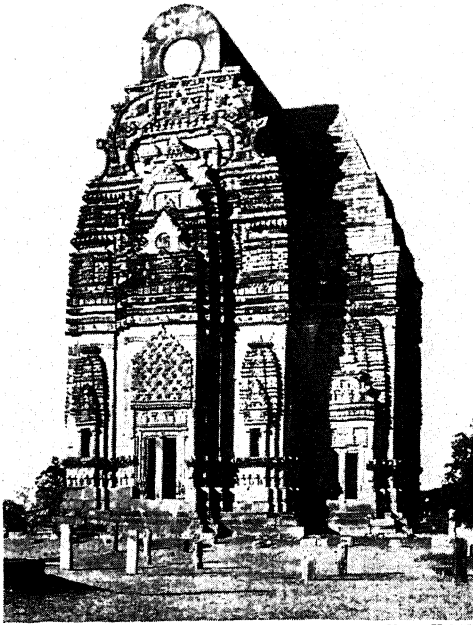
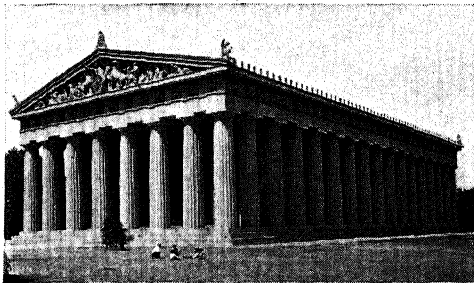


Photo: U & U

SPLENDOR OF ANCIENT INDIA

A beautiful Hindu temple at Gwalior, built between 1486 and 1516. Elaborate and beautiful bas-relief carvings characterize the exterior.

copied it, and made the semicircular arch the distinguishing feature of their work. In other respects, their architecture is largely a modification of Greek styles. With the arch, it was possible for the Romans to construct interiors of a size previously not dreamed of, and to substitute bricks and small stones held together



"THE GLORY THAT WAS GREECE"

This is not the Parthenon at Athens, however, but a practically perfect replica of which Nashville, Tenn., is very proud. It is Nashville's public museum, in a city park.

by cement for the enormous unmortared slabs of Egypt and Greece. The great arches of aqueducts and bridges; the enormous vaults of the baths, sometimes over 100 feet high; the dome of the Pantheon—all are tributes to the skill with which Roman architects and

engineers utilized the new knowledge. But the semicircular arch required exceedingly heavy walls for its support, for reasons which are explained in the article *BRIDGE*, and made Roman works impressive for their size rather than for their grace.

The Pantheon, as rebuilt by the Emperor Hadrian in the second century A.D., is an illustration of both the Greek and the Etruscan influence on Rome. From the outside, it is truly not a pleasing structure; the square, pillared entrance does not accord with the massive circular walls. Inside, however, the huge dome, over 140 feet in both diameter and height, is striking. Other forms characteristic of



Photo: U & U

SANCTUARY OF ART AND PIETY

The great Pantheon in Rome.

Rome were the Colosseum, Forum, atrium, basilica, and aqueduct, all of which are described in these volumes.

After Rome. The fall of Rome was not the fall of all things Roman. The empire of the Caesars had left its stamp upon the languages, laws, and religion of the Western world, and to an even greater extent on its architecture. Wherever Roman soldiers went, people learned to build the arch, the vault, and the dome.

In the East, the mingling of Roman and Oriental ideas produced a style known as *Byzantine*, of which the Mehmedie Mosque (for centuries called Saint Sophia), in Constantinople, is typical. From the outside this huge pile of brick is unattractive, but its interior, before Turkish occupation in 1453, was probably the most gorgeous in the world. Red, green, and black marble, precious stones, mosaics—all have a part in it, yet there is no confusion of colors, for all are placed according to a defined scheme. Much of the gracefulness of this interior is due to the placing of the dome upon square walls, a feat of construction unknown to the Romans. It was accomplished

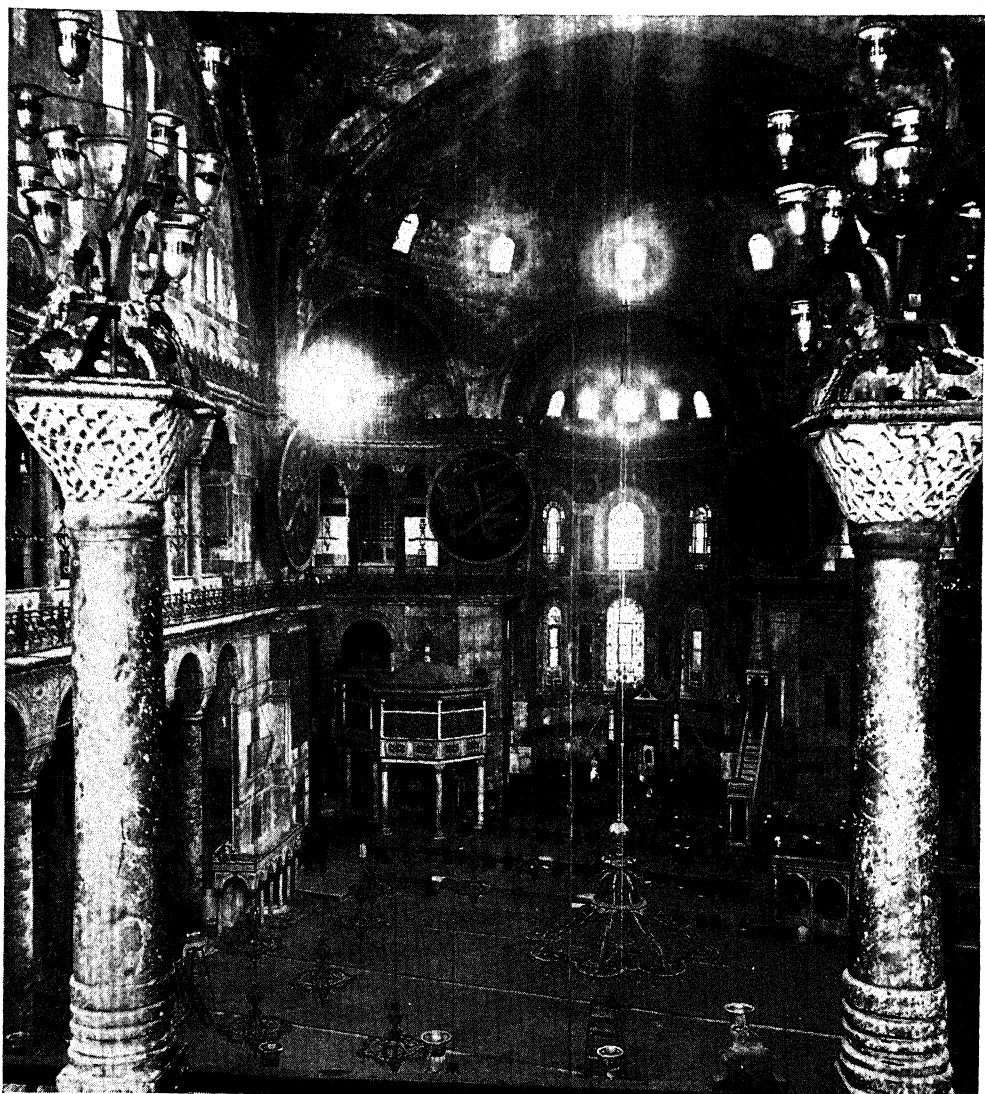


Photo: U & U

A SACRED INTERIOR DESTINED FOR DESECRATION

The famed mosque of Saint Sophia, in Constantinople, renamed Mehmedie Mosque (Mosque of Mohammed) in 1923. Faithful followers of Islam were alarmed when officials of the new National State of Turkey proposed to use the building as a public dance hall. The ancient religion of the Turks is not venerated by the new government.

by means of *pendentives*, curving brackets of stone at the corners, which, as may be seen from the accompanying illustration, formed an arch on each of the four sides and carried the weight of the dome to the corners. Saint Mark's, Venice, another famous Byzantine church, resembles the Mehmedie Mosque in many respects.

In the West, early Christian churches were formed in imitation of the basilicas or halls of Roman residences. There was nearly always a long room bordered with pillars; an aisle on

each side whose roof was lower than the central roof and permitted a *clerestory*, or row of windows, above it; and an *apse*, or semicircular projection, at the end. These features have influenced church architecture from Constantine's time to the present day.

There was in the West no type of architecture to blend with the Roman and form a style corresponding to the Byzantine in the East. What took place was a gradual development into the fashion called *Romanesque*. In general, the tendency was away from the

heaviness of the older construction. In Lombardy, vaults were supported by ribs at the intersections of surfaces (see the article on VAULT and the picture of a groined vault), the ribs resting on pillars and making massive walls unnecessary. In Burgundy, architects learned to construct groined vaults in oblong shape in place of the square vaults to which others had been confined. In Germany first, then elsewhere, the church tower was made a part of the main building, instead of a separate structure (see CAMPANILE).

Gothic, the Expression of a New Life. The student of architectural history misses half the interest of his subject if he does

not notice how clearly the buildings of a nation or of an age may indicate the spirit of the times. The solemnity of old Egypt, the keen intelligence of Greece, the unconquerable will of Rome—are all recorded in brick and stone. When we come to the age of awakening understanding which preceded the glorious rebirth of Europe, called the *Renaissance*, we find an example even more striking. Emerson calls the Gothic cathedral “a blossoming in stone” and adds: “The mountain of granite blooms into an eternal flower, with the lightness and delicate finish, as well as the aerial proportions and perspective, of vegetable beauty.”

Structurally, Gothic architecture is marked, first of all, by the pointed arch, which can be raised to impressive heights without increase in width; it needs no heavy walls to resist outward thrust, and permits vaults of any shape. In true Gothic style there is not a wasted stone. All weight is carried by a skeleton of arches, piers, and flying buttresses; real walls are almost lacking, for the spaces between outside piers are filled by lofty windows.

The Gothic style had its birth in France. It was copied in England and Germany, Spain

and Italy, but nowhere in its purity. Various

modifications arose, mostly with elaborate ornamentation (see GARGOYLE; TRACERY; TUDOR STYLE). Gothic structures of special note are the cathedrals of Notre Dame, Lincoln, Cologne, Rheims, Milan, and Amiens. The first of these is pictured under its own heading, the second appears in the illustration at the head of this article, and the third and fourth, under CATHEDRAL.

The Renaissance and After. It was in Italy that the reawakened interest in the works of past ages which characterized the Renaissance first manifested itself. Here architects were able to study the fragmentary remains of classical



Photo: Keystone

AN EXTERIOR VIEW OF OLD SAINT SOPHIA

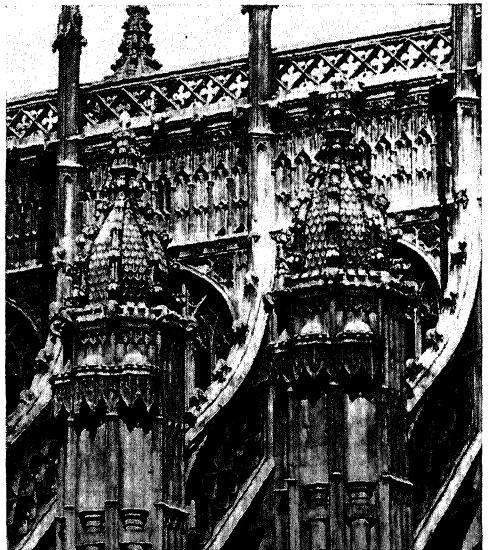


Photo: U & U

THE STONEMASON'S PINNACLE OF FAME
Striking beauty high on Westminster Abbey.

Roman structures, and to adopt into their

OUTLINE AND QUESTIONS ON ARCHITECTURE

Outline

- | | |
|---|---|
| <p style="text-align: center;">I. What It Is</p> <p>(1) An art
(2) A science</p> <p style="text-align: center;">II. What Good Architecture Means</p> <p>(1) Beautiful buildings
(2) Suitable buildings
(3) Useful buildings</p> <p style="text-align: center;">III. Development of Architecture</p> <p>(1) Earliest forms
 (a) Egyptian
 1. Dignity
 (b) Babylonian and Assyrian
 1. Material
 2. Style</p> | <p>(c) Greek
 1. Sense of proportion
 2. Avoidance of harsh lines
 3. Three types of columns
(d) Roman
 1. Arch
(2) Later styles
 (a) Byzantine
 (b) Romanesque
 (c) Gothic
 1. Pointed arch
(d) Renaissance</p> <p style="text-align: center;">IV. Modern Problems</p> <p>(1) Home-building
(2) "Skyscrapers"</p> |
|---|---|

Questions

- What door in the United States is a perfect example of colonial design?
 What is probably the best-known church in the world?
 What building is the tallest in the world?
 If you wished to build a home should you consider it wise to draw up your plans and turn them over to a building contractor?
 What three demands must every perfectly successful building fulfil?
 What is the greatest debt which later architecture owes to the Greeks?
 In what style of architecture is the capitol of your state or province?
 How can you recognize Gothic architecture infallibly?
 What is regarded as the most perfect building ever constructed?
 May an architect be a "pure artist," or must he have a definite knowledge of certain material things?
 In what suggestive manner did Goethe define architecture?
 Have you ever seen a building which seemed to you to fit this definition? Do most of the houses, stores, or churches which you pass?
 What are some of the difficulties which the architect of a modern sky scraper has to overcome?
 The Woolworth Building is 750 feet high and weighs 360,000,000 pounds. Is it as tall as the greatest pyramid? Does it weigh as much?
 What were the distinguishing marks of Egyptian architecture?
 What was the great architectural achievement of the Romans?
 Did the architects of the eighteenth or nineteenth century develop any new style of architecture?
 Could the Romans have built their great bridges and aqueducts if they had not developed a new architectural form?
 What are Cleopatra's Needles?
 What was the building material of the Babylonians and Assyrians?
 Who was the architect of the dome of Saint Peter's?
 Is there in Europe any good example of Mohammedan architecture?
 What is a *clerestory*? An *apse*?
 How did Emerson describe Gothic architecture?

own practice those elements which pleased them best. After the visit of the court of King Charles VIII of France to Rome in 1494, the revival of classic forms began to influence French architecture, and soon spread to other countries. It is characteristic of the new age that other edifices than churches were now thought worthy to try the architect's skill, and the palaces, castles, chateaus, and town halls of the Renaissance period show plainly that their designers were influenced by those of imperial Rome.

The Church of Saint Peter, at Rome, is a product of this age of classical

SAINT PETER'S. The dome, like that of the Pantheon, is formed entirely of masonry, without the timber frame found in most European domes. But its umbrella-like ribs, and the lack of the Pantheon's heavy walls, show the lessons learned in Romanesque and Gothic vault construction. The big drum, or circular wall beneath the dome and the small drum above, are each marked by a row of pillars shaped to give the appearance of pairs of classic columns.

Since the Renaissance the practice of studying the best work of days gone by has continued. Fresh problems have arisen, especially

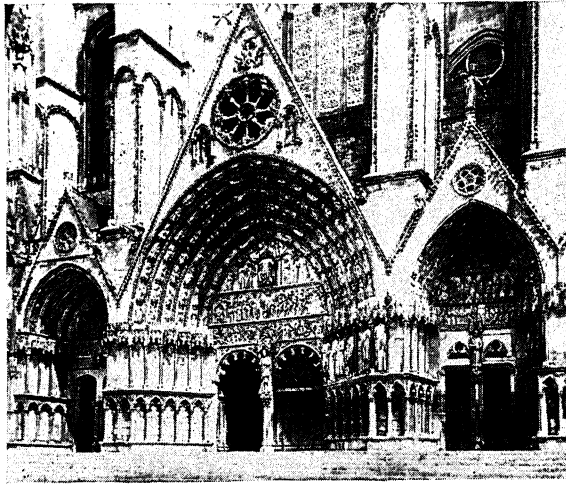


Photo: U & U

MAGNIFICENT ENTRANCE TO A CATHEDRAL

Artistic France unperturbed in its architectural grandeur by war's devastations. In this cathedral at Bourges lie the remains of unfortunate and ill-advised Louis XVI of France.



Photo: U & U

INTERIOR OF RHEIMS CATHEDRAL

study. Its great cupola, constructed in the second half of the sixteenth century according to plans which Michelangelo had drawn, may be seen in the illustrations with the article

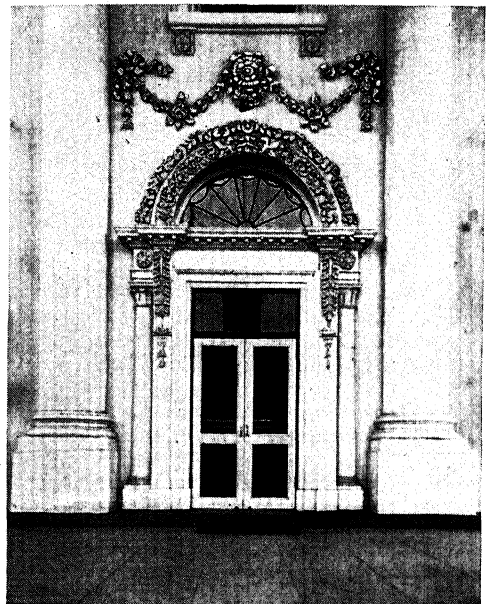
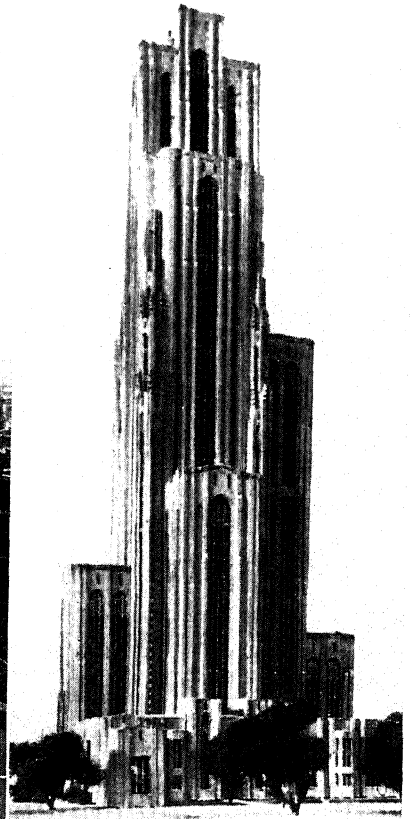


Photo: Keystone

THE MOST INTERESTING DOOR IN AMERICA

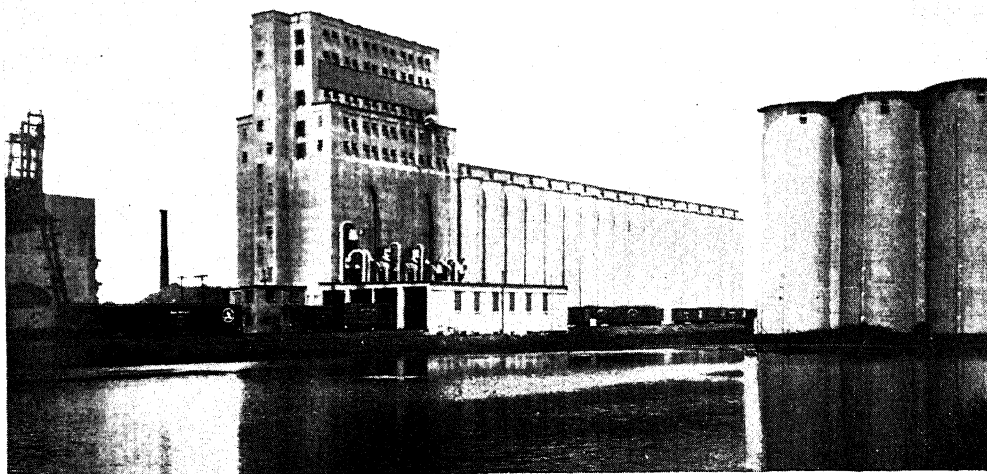
Is the front door of the White House, in Washington. It is one of the most artistic examples of colonial design. Unfortunately, the screen doors detract from the beauty of the workmanship.

in America, where the skyscraper, built with a skeleton of steel or concrete, has transformed



Photos: Saint Louis News Service; U & U; Themott Studios

Beauty and Utility. The thirty-one story building of the Bell Telephone Company of Saint Louis is one of America's finest examples of step-back architecture. To the right is the "Cathedral of Learning," a new building of the University of Pittsburgh. (See, also, page 37c.) Concrete is adapted to pleasing designs in industrial buildings, as is seen in a mail-order structure in Los Angeles.



Occident Grain Elevator, Duluth.

STRIKING EXAMPLES OF

the science of building. But so far, no new style worthy to succeed has been evolved, except the step-back style, whereby city ordinances permit the erection of very tall buildings, provided the top stories are set back from the street building line, as is shown in illustrations in this article. In the exterior design of a modern tall building, two of the tasks of the architect are to avoid the monotony which is apt to result from the multitudes of regularly arranged windows, and to prevent the great height of the structure from making the dimensions seem poorly proportioned. In solving these problems the architect draws from his knowledge of the achievements of past centuries. Thus, as any observer may discover, many recently constructed office buildings have elements of classic or of Gothic design. Continuous vertical strips between windows often end at the top in pilasters, and cornices are sometimes employed. The striking resemblance between the tower of the Woolworth Building, until 1929 the tallest of tall buildings, and those of Lincoln Cathedral, built nearly six centuries earlier, is shown at the head of this article.

Related Subjects. The following lists, which contain general architectural topics, names of buildings of note, and the world's greatest architects, will give to the reader a comprehensive view of the subject:

GENERAL

Air Rights (Illustrations)	Concrete (Construction)
Arabesque	Cupola
Arcade	Dome
Arch	Facade
Atrium	Finial
Basilica	Gable
Caryatides	Gargoyle
Castle	Keystone
Column	Lighthouse

Loggia
Mansard Roof
Norman Architecture
Obelisk
Pagoda
Pediment
Pendant
Pendentive
Pilaster

Roofs
Round Towers
Spire
Stadium
Theater
Tower
Tracery
Tudor Style
Vault

FAMOUS STRUCTURES

Alamo
Alhambra
Arch of Triumph
Athenaeum
Capitol
Cleopatra's Needles
Colosseum
Eiffel Tower
Erechtheum
Escorial
Federal Hall
Forum
Hippodrome
Kremlin
Liberty, Statue of
Library of Congress

Louvre
Nike Apteros
Pantheon
Parthenon
Statuary Hall
Stonehenge
Taj Mahal
Theseum
Tower of London
Tuileries
Vatican
Washington Arch
Washington Monument
Westminster Hall
White House
Windsor Castle

ECCLESIASTICAL ARCHITECTURE

Abbey
Campanile
Cathedral
Cloister
Kaaba
Mehmedie Mosque
Minaret
Mohammedan Architecture
Mosque

Notre Dame, Cathedral of
Rose Window
Saint Mark's, Cathedral of
Saint Peter's Church
Synagogue
Tabernacle
Temple
Westminster Abbey

ARCHITECTS

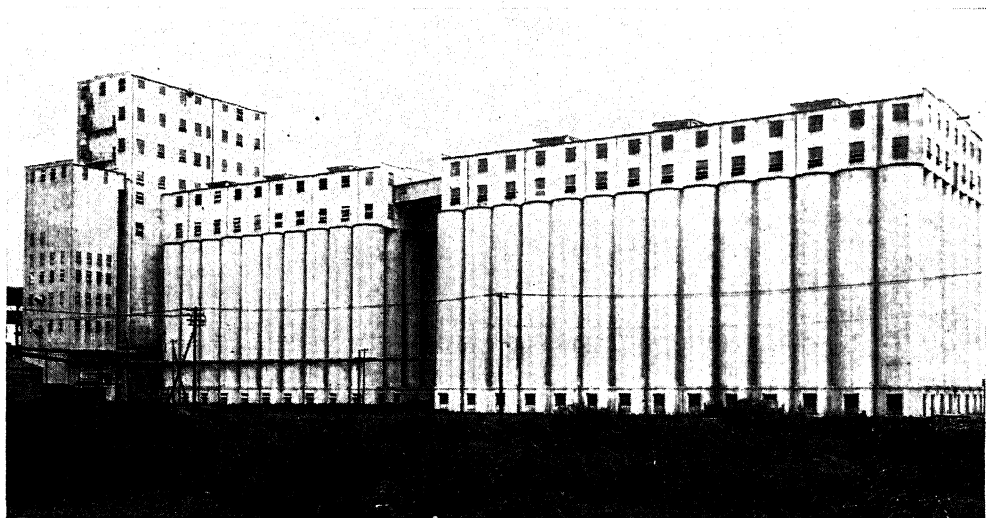
Bramante, Donato
Brunelleschi, Filippo
Bulfinch, Charles

Burnham, Daniel
Hunt, Richard Morris
Michelangelo Buonarroti

Wren, Sir Christopher

ARCHITRAVE, *ahr' kie trayv*. See COLUMN (Doric Column).

ARCH OF CONSTANTINE. See CONSTANTINE, subhead.



CONCRETE CONSTRUCTION

Municipal Grain Elevator, New Orleans.

ARCH OF TITUS. See **TITUS**, subhead.

ARCH OF TRAJAN. See **TRAJAN**, subhead.

ARCH OF TRIUMPH, situated at the head of the Champs Elysées, one of the most beautiful streets in Paris, is the largest triumphal arch in the world. It was begun by Napoleon Bonaparte in 1806, to commemorate his victories, and was completed by Louis Philippe in 1836. Harmonious in proportions and imposing in design, this famous structure rises to a height of 160 feet. Its central archway is forty-eight feet broad and ninety-five feet high, and on its inner walls are inscribed the names of 384 of Napoleon's generals and ninety-six of his great triumphs. Among the striking decorations are four groups of colossal figures, sculptured in high relief. One of these symbolizes the departure of the volunteers of 1792.

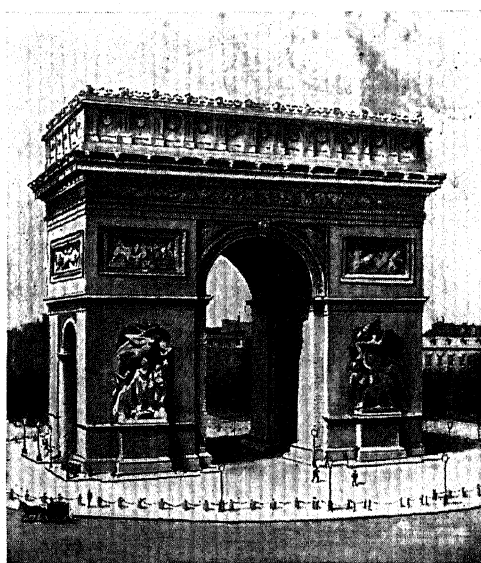
After the World War, the French placed the grave of the Unknown Soldier beneath the arch; a perpetual flame burns at this shrine. See **UNKNOWN SOLDIER**.

[The name in French is **ARC DE TRIOMPHE DE L'ETOILE**, meaning *triumphal arch of the star*.]

ARCHON, *ahr' kon*, the highest officer in ancient Athens. The first archon was chosen by the nobles from the royal family of Codrus, the last king of Athens, and his term of office was for life. In 752 B.C., the length of the term was shortened to ten years, and in 714 B.C. the archonship was thrown open to all the nobles. In 682 B.C., the number of archons was increased to nine, and they were chosen every year.

The reforms of Solon gave anyone who had a certain amount of property the right to hold the office, and in 477 B.C., under Aristides, this right was given to all Athenian citizens. After

508 B.C., the archons were chosen by lot. The first of the nine archons, called *the Archon*, gave his name to the year in public records; the second had the care of the religious interests of the people; the third, the *Polemarch*, was the



ARCH OF TRIUMPH

A monument to the successes of the great Napoleon—but without a suggestion of the anti-climax at Saint Helena.

war archon. The other six were the lawgivers of the state. See **ARISTIDES**; **CODRUS**.

ARCTIC, *ark' tik*, **CIRCLE**. At the North Pole the year is divided into six months of



ANOTHER "CATHEDRAL OF LEARNING"

Imposing group of professional buildings on McKinlock Campus, Northwestern University, Chicago, overlooking Lake Michigan. (See, also, page 367.)

night and six months of day. The Arctic Circle, represented on the globe as twenty-three and one-half degrees distant from the North Pole and parallel to the equator, indicates the northern region within which periods of continuous light or darkness may exceed twenty-four hours. The name comes from *arktos*, by which the constellation Great Bear was known to the Greeks (see BEAR, GREAT).

When the sun reaches the Tropic of Cancer on its northward journey, its rays shine for a day and night over the whole area between the Arctic Circle and the North Pole. When, however, it reaches the Tropic of Capricorn, twenty-three and one-half degrees south of the equator, darkness prevails over this same desolate northern region, but only the Poles have the full six months of continuous daylight and darkness. The Arctic Circle just touches the northern headlands of Iceland, cuts off the southern and narrowest portion of Greenland, crosses Fox's Strait, north of Hudson Bay, whence it extends westward to Bering Strait, continuing across Northern Russia, the White Sea, and the Scandinavian peninsula to Iceland. See map, accompanying the article ARCTIC LANDS AND SEAS. See, also, ZONE.

R.H.W.

ARCTIC LANDS AND SEAS, barren, inhospitable regions of snow-covered lands and ice-bound seas, situated between the Arctic Circle and the North Pole. The name Arctic Ocean is applied collectively to all the gulfs, bays, and seas within the Arctic region. The

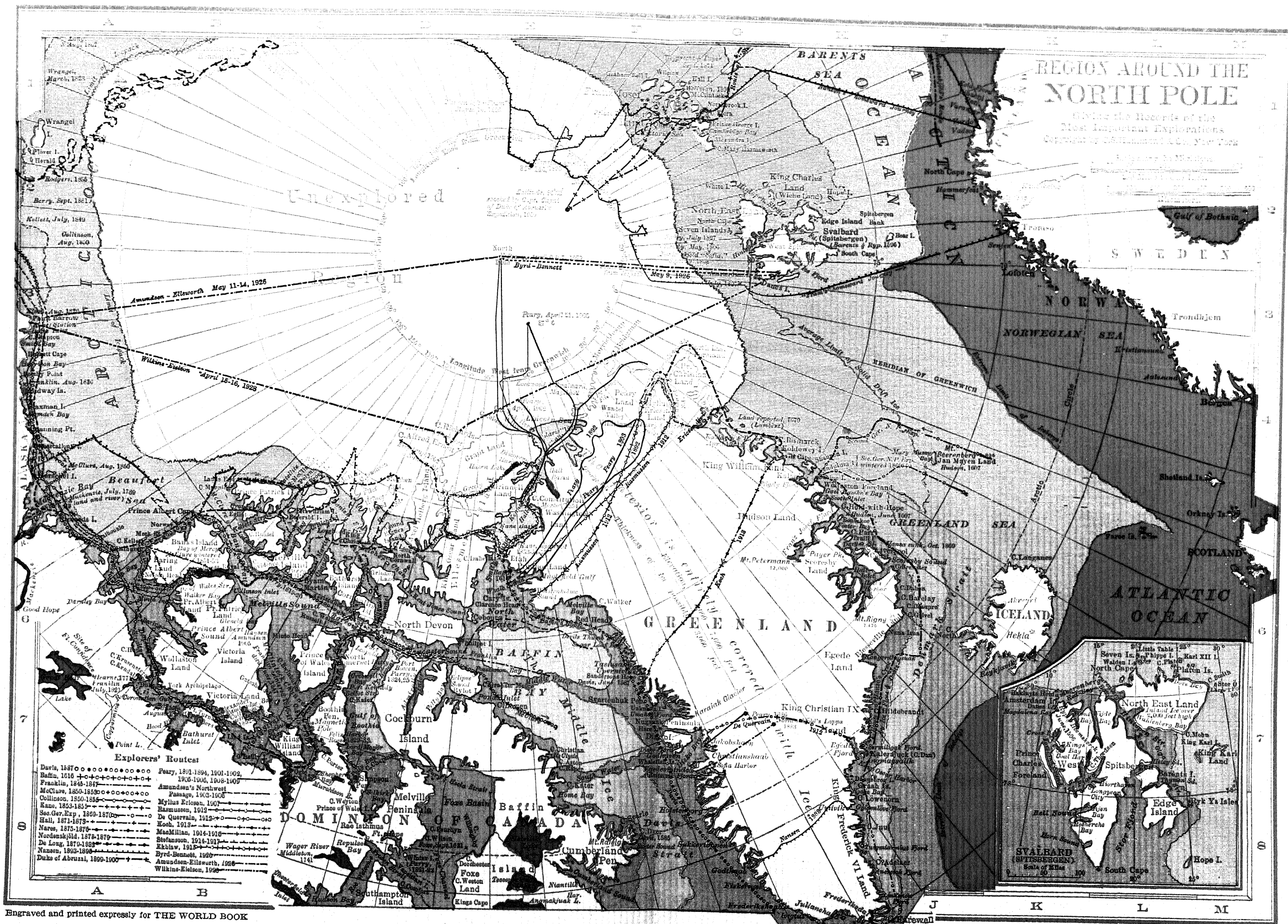
ocean washes the most northerly shores of Europe, Asia, and America, is connected with the Pacific Ocean by Bering Strait and with the Atlantic Ocean by Davis Strait and a wide passage between Greenland and Norway. It contains numerous islands, the largest of which are Greenland, Spitsbergen, Franz Josef Land, and Baffin Land, although only part of the latter is within the Arctic Circle. To the north of Canada there are the ice-bound islands which constitute the Arctic Archipelago.

Animal Life. Fur-bearing animals are very numerous in Arctic lands, and are well able to withstand the rigors of the climate. The polar bear, fox, musk ox, lemming, and hare abound, and the Eskimo dog and the reindeer have been acclimatized and domesticated. Whales of several species, seals, and walrus are found in most parts of the ocean. Birds are very plentiful. Gulls of many kinds are found in thousands wherever there are cliffs for nesting places; snowbirds, ravens, sandpipers, falcons, ducks, geese, petrels, puffins, and ptarmigans are also among the regular inhabitants of these northern regions. There are valuable fisheries on the northern coast of Russia; more than 125 varieties of fish have been caught in Arctic waters, the chief food fishes being cod, halibut, and several kinds of flatfish. Trout and salmon are found in some Arctic rivers.

Plant Life. About 1,700 species of Arctic plants have been classified, many closely resembling Alpine vegetation; 900 different

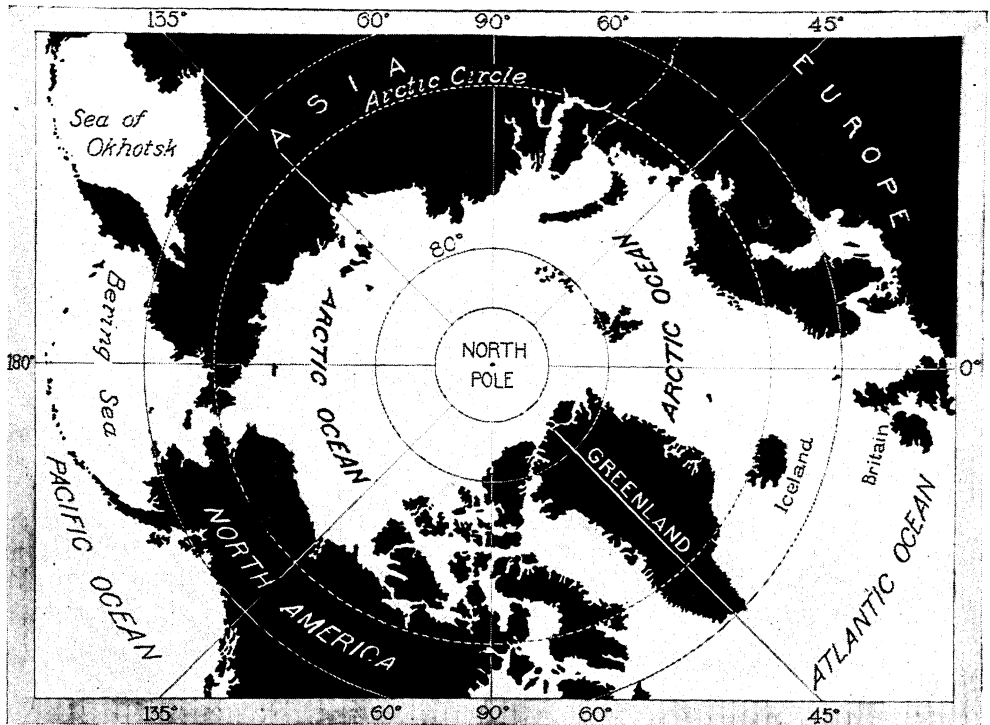
REGION AROUND THE NORTH POLE

Aalesund.....	L 4	Dannebrog Island.....	H 7	Hekla Harbor.....	H 6	Manning Point.....	A 4
Adelaar, Cape.....	J 8	Darney Bay.....	A 6	Hekla mt.....	K 6	Mary Harnsworth, Cape.....	G 2
Admiralty Inlet.....	D 7	Davis Strait.....	F 8	Heley Sound.....	L 7	Mary Mussy Bay.....	J 4
Akreyn.....	K 6	Davy Sound.....	H 5	Henrietta Island.....	B 1	Meek Point.....	A 5
Alaska.....	A 5	Dease Inlet.....	A 3	Herald Island.....	A 5	Meighen Island.....	D 5
Alexander, Cape.....	B 7	Dease Strait.....	B 7	Hildebrandt, Cape.....	J 7	Melville Bay.....	F 6
Alexandra Island.....	G 1	De Long Fjord.....	F 4	Hinlopen Strait.....	G 2	Melville Island.....	C 5
Alfred Ernest, Cape.....	D 4	De Long Island.....	C 1	Hiorthaven.....	L 7	Melville Peninsula.....	D 8
Amsterdam Island.....	G 3	Demarcation Island.....	A 5	Hold with Hope, Cape.....	H 5	Melville Sound.....	C 6
Amund Rignes Island.....	D 5	Denmark Sound.....	F 4	Holstenborg.....	G 8	Mercy, Bay of.....	B 5
Angmagssalik.....	J 7	Denmark Strait.....	J 6	Home Bay.....	E 8	Middle Ice, The.....	E 7
Angmakjuak Lake.....	E 8	Devils Cape.....	H 4	Hood River.....	B 7	Middle Water.....	E 6
Anirstok Fjord.....	J 8	Devils Thumb Bay.....	F 6	Hope, Cape.....	A 6	Midway Islands.....	A 4
Arctic Ocean.....	A 3	Discovery Harbor.....	E 5	Hope, Fort.....	D 8	Mijen Bay.....	L 8
Assistance Bay.....	C 6	Disko Bay.....	G 7	Hope Island.....	H 2	Minto Head.....	C 6
Aston, Cape.....	E 7	Disko Fjord.....	F 7	Horn Sound.....	K 8	Minto Inlet.....	B 6
Atlantic Ocean.....	L 6	Disko Island.....	F 7	Hudson Bay.....	C 8	Mohn, Cape.....	M 7
Aulaitisvig Fjord.....	F 7	Dolphin and Union Strait.....	A 6	Hudson Land.....	G 5	Montreal Island.....	C 8
Axel Herberg Island.....	D 5	Dorchester, Cape.....	D 8	Ice Fjord.....	H 3	Morris Jesup, Cape.....	F 3
Back River.....	E 8	Dove Bay.....	L 6	Iceland.....	K 6	Murchison River.....	C 8
Baffin Bay.....	E 6	Dubawnt Lake.....	B 8	Independence Sound.....	F 3	Mylius Ericson Land.....	F 4
Baffin Island.....	E 8	Duke of York Archipelago.....	B 7	Inglefield Gulf.....	E 6	Nansen Sound.....	D 5
Baker, Lake.....	B 8	Dyer, Cape.....	F 8	Isabella, Cape.....	E 5	Nelsen Head.....	B 6
Banks Island.....	B 5	Eclipse Sound.....	D 7	Isachsen, Cape.....	D 5	Netsilik Lake.....	E 8
Banks or McClure Strait.....	B 5	Edge Fjord.....	H 7	Ivigut.....	H 8	Niantilik Harbor.....	E 8
Barclay, Cape.....	J 6	Edge Island.....	H 2	Jakobshavn.....	G 3	Northbrook Island.....	G 1
Barents Island.....	L 7	Egedesminde.....	F 7	James Ross Strait.....	C 7	North Cape.....	J 6
Barents Sea.....	H 1	Eglington.....	B 5	Jan Mayen Land.....	J 4	North Cape.....	J 2
Baring, Cape.....	A 6	Ellef Rignes Island.....	D 5	Jeannette Island.....	B 1	North Cornwall.....	D 5
Baring Land.....	B 6	Ellesmere Island.....	D 6	Jones Sound.....	D 6	North Devon.....	D 6
Barrow, Point.....	A 3	Emerald Island.....	C 5	Joseph Henry, Cape.....	E 4	North East Foreland.....	G 3
Barrow Strait.....	C 6	Erebhus Bay.....	C 7	Julianehaab.....	H 8	North East Land.....	G 2
Bathurst, Cape.....	A 5	Etah.....	E 5	Juul, Cape.....	H 7	North Kent.....	D 6
Bathurst Inlet.....	C 6	Eureka Sound.....	D 5	Kalerajack (Cape Dan).....	H 8	North Magnetic Pole.....	C 7
Bathurst Island.....	C 7	Exeter Sound.....	F 8	Kane Basin.....	E 5	North Pole.....	E 3
Batty Bay.....	D 6	Farewell, Cape.....	J 8	Kangerdlugsuaq.....	J 6	North Somerset.....	C 6
Bear Island.....	J 2	Faroe Islands.....	L 5	Karaik Glacier.....	G 7	North Water.....	E 6
Beaufort Sea.....	A 5	Felix, Cape.....	C 7	Karl XII Island.....	F 8	Norway.....	K 3
Beaure, Cape.....	J 6	Felix Harbor.....	C 7	Kater, Cape.....	F 8	Norway Island.....	B 5
Beechey Island.....	C 6	Finland.....	K 1	Kater, Cape.....	C 7	Norwegian Sea.....	K 3
Beechy Point.....	A 4	Fiskermoes.....	G 8	Kautokeino.....	A 5	Nugsuak Peninsula.....	F 7
Belcher Channel.....	D 5	Fitzwilliam Island.....	C 5	Kellett, Cape.....	A 5	Nuna Isua.....	J 6
Bell Strait.....	C 7	Flaxman Island.....	A 4	Kellett Strait.....	B 5	Olga Strait.....	L 7
Bell Sound.....	K 8	Fligely Fjord.....	G 5	Kendall, Cape.....	A 7	O'Reilly Island.....	B 7
Bergen.....	M 4	Flinders, Cape.....	B 7	Kennedy Channel.....	E 5	Orkney Islands.....	M 5
Bismarck, Cape.....	H 4	Flora, Cape.....	G 1	Kennedy, Port.....	D 7	Parry, Cape.....	H 5
Blosseville Land.....	H 6	Foreland Sound.....	K 7	King Charles Land (Wiche Land).....	H 2	Parry, Cape.....	A 6
Bontekoe Island.....	H 5	Fort Confidence, Site of.....	A 6	King Christian Island.....	C 5	Payer Peak.....	H 5
Boothia, Gulf of.....	C 7	Foster Bay.....	H 5	King Christian IX Land.....	H 7	Pearly Land.....	F 4
Boothia Peninsula.....	C 7	Foxe Basin.....	D 8	King Frederick VI Land.....	H 8	Peel Sound.....	C 6
Borden Island.....	C 5	Foxe Channel.....	D 8	King Karl Island.....	M 7	Pelly Bay.....	D 7
Bosekop.....	K 2	Foxe Land.....	D 8	King Karl Land.....	M 7	Pelly Bay.....	C 7
Bothnia, Gulf of.....	M 2	Franklin Bay.....	A 6	King Oscar Harbor.....	H 7	Pendulum Island.....	H 5
Bowen, Cape.....	E 7	Franklin Island.....	E 6	King Oscar Land.....	D 5	Penny Strait.....	C 6
Bowen, Port.....	D 6	Franklin Strait.....	C 7	Kings Bay.....	K 7	Penrhyn, Cape.....	D 8
Brewster, Cape.....	J 5	Franz Josef Fjord.....	H 5	Kings Cape.....	D 8	Pettermann, Mount.....	G 6
Bridgman, Cape.....	F 3	Franz Josef Land.....	F 1	King William Island.....	C 7	Philpot Island.....	E 6
Brock Island.....	C 5	Frederiksdal.....	H 8	King William Land.....	G 5	Phipps Island.....	L 6
Byam Martin Channel.....	C 6	Frederiksaa.....	G 8	Kjoge Bay.....	H 8	Platen, Cape.....	L 6
Byam Martin Island.....	C 6	Frozen Strait.....	D 8	Kola.....	K 1	Platen Island.....	L 6
Bylot Island.....	D 7	Fury and Hecla Strait.....	D 8	Koldewey Islands.....	H 4	Plover Island.....	A 2
Cambridge Bay.....	G 1	Gael Hamke's Bay.....	H 5	Kristiansund, Cape.....	A 6	Point Lake.....	A 7
Cambridge Bay.....	B 7	Gateshead Island.....	B 7	Kulm Island.....	H 5	Polynia Islands.....	C 5
Camden Bay.....	A 4	Glenela Bay.....	B 6	Lancaster Sound.....	D 6	Ponds Inlet.....	E 7
Canada, Dominion of.....	E 8	Glydenlove Fjord.....	H 8	Lands End.....	B 5	Porter, Cape.....	C 7
Cary Islands.....	E 6	Godthaa.....	G 8	Langanes, Cape.....	K 5	Possession Bay.....	E 6
Chapman, Cape.....	D 7	Good Hope.....	A 6	Large Island (Stor O).....	M 6	Prince Albert Bay.....	B 5
Chesterfield Inlet.....	C 8	Graham Bell Island.....	F 1	Leopold Island.....	D 6	Prince Albert Sound.....	B 6
Christian, Cape.....	E 7	Graham Moore, Cape.....	E 7	Leopold, Port.....	D 6	Prince Charles Foreland.....	K 7
Christianshaab.....	G 7	Grant Land.....	E 5	Liddon Gulf.....	B 5	Prince Christian Land.....	G 4
Clarence Head.....	E 6	Great Bear Lake.....	A 7	Lincoln Sea.....	E 4	Prince George Island.....	G 1
Clyde, River.....	E 7	Greely Fjord.....	D 5	Lindenow Fjord.....	J 8	Prince of Wales Island.....	C 6
Coal Harbor.....	K 7	Greenland.....	G 6	Lind Island.....	B 7	Prince of Wales Strait.....	B 6
Cobourg Island.....	E 6	Greenland Sea.....	J 5	Little Table Island.....	L 6	Prince Patrick Island.....	C 5
Cockburn Island.....	D 7	Grinnell Land.....	D 6	Liverpool Coast.....	H 5	Prince Patrick Land.....	B 6
Collinson Inlet.....	B 6	Grinnell Land.....	E 5	Lockwood, Cape.....	D 5	Prince Regent Inlet.....	D 6
Columbia, Cape.....	E 4	Grivel, Cape.....	J 6	Lofoten.....	K 3	Prince Rudolph Island.....	F 1
Comfort, Cape.....	D 8	Hakluyts Hold.....	K 7	Longhead Island.....	C 5	Princess Royal Islands.....	B 6
Constitution, Cape.....	E 5	Halkett Cape.....	A 4	Longyear City.....	C 7	Providence, Cape.....	B 6
Coppermine River.....	A 7	Hall Basin.....	E 5	Lord Mayor Bay.....	C 7	Prudhoe Land.....	E 5
Cornwallis Island.....	C 6	Hall Inlet.....	H 6	Lowenorn, Cape.....	H 8	Queen Victoria Sea.....	F 1
Coronation Gulf.....	A 7	Hall Island.....	G 1	McClintock, Cape.....	C 5	Rae Isthmus.....	C 8
Creswell Bay.....	C 7	Hammerfest.....	J 2	McClintock Channel.....	C 6	Raleigh, Mount.....	F 8
Cross Bay.....	K 7	Hare Island.....	F 7	McClintock Island.....	G 1	Raper, Cape.....	E 7
Crozier Channel.....	B 5	Harrison Bay.....	A 4	McClure or Banks Strait.....	B 5	Recherche Bay.....	L 8
Cumberland Peninsula.....	F 8	Hassel Sound.....	D 5	Mackenzie Bay.....	A 5	Red Bay.....	K 7
Cumberland Sound.....	F 8	Hazen Lake.....	E 5	Mackenzie River.....	A 6	Red Head.....	F 6
Dahon, Cape.....	J 6	Hecla, Cape.....	E 4	Magdalena Bay.....	K 7	Relief Station.....	A 3
Dalhousie, Cape.....	A 7	Hekla and Griper Bay.....	C 5	Manning, Cape.....	B 5	Repulse Bay.....	C 8
Dan, Cape (Kalerajack).....	H 7					Reykjavik.....	K 6
Danes Island.....	G 3						
Danish Sound.....	C 5						



REGION AROUND THE NORTH POLE *Continued*

Ribachi Peninsula.....	J 1	Shetland Islands	L 5	Tosseyoakjuak Lake	E 8	Walker, Cape	F 6
Richard, Cape	C 5	Simpson, Cape	A 3	Traill Island	H 5	Wandel Valley	F 4
Richards, Cape	D 4	Simpson Peninsula.....	D 8	Tromso.....	K 2	Washington Land	E 5
Richards Island.....	A 5	Simpson Strait.....	C 7	Trondhjem	M 3	Wellington Channel	D 6
Rigny, Mount.....	H 6	Smeerenberg.....	K 7	Trurenberg Bay	L 6	Weston, Cape	D 8
Roe Welcome	C 8	Smith Bay	A 3	Tuigmiarmiut Fjord	J 8	West Spitsbergen	H 2
Roleson Channel.....	E 4	Smith, Cape	M 6	Turnagain, Point.....	B 7	Weyton, Cape	C 8
Russel, Cape.....	C 5	Smith Sound.....	E 5	Umanak	F 7	Whalefish Islands	F 7
Russell Island	C 6	Sofia Harbor	G 7	Umanka Fjord.....	F 7	Whale Island.....	A 5
Ryk Ys Isles	M 8	Southampton Island.....	D 8	Umnvik.....	H 8	Whale Sound	E 6
Sabine Island	H 5	South Cape.....	H 2	Unknown Island	F 7	White Island.....	G 2
Saint George Fjord.....	F 5	South Water	F 7	Upernivik.....	F 6	Wiche Land (King	
Sandersons Hope	F 6	Spitsbergen Bank	H 2	Vadso	J 1	Charles Land).....	H 2
Satellite Bay.....	C 5	Spitsbergen (Svalbard)	H 2	Vansittart Island	D 8	Wijde Bay.....	L 7
Scoresby Land.....	H 5	Stor Fjord	H 2	Naranger Fjord	J 1	Wilezek Island	F 1
Scoresby Sound.....	J 5	Stor O (Large Island)	M 6	Vardo	J 1	Willoughby, Cape.....	D 8
Scotland.....	M 5	Sugarloaf Bay.....	F 6	Victoria Island	B 6	Wilson, Cape.....	D 8
Scotts Inlet.....	H 5	Sukkertoppen	G 8	Victoria Land	B 7	Winter Harbor.....	C 6
Searle, Cape	F 8	Svalbard (Spitsbergen)	H 2	Victoria Strait	B 7	Winter Island	D 8
Selkirk Bay.....	D 8	Svartenhuk Peninsula.....	F 7	Vildtland.....	F 4	Wollaston Foreland.....	H 5
Senjen.....	K 2	Sweden.....	L 2	Wager River	C 8	Wollaston Land	B 6
Sermiligak Fjord	H 7	Swinburne, Cape.....	C 7	Wahlenberg Bay.....	L 7	Wolstenholme Sound	E 6
Seven Islands.....	G 2	Tasiusak.....	F 6	Walden Island.....	L 6	Wood Bay	K 7
Shannon Island.....	H 4	Thorsen, Cape.....	L 7	Walker Bay.....	B 6	Wrangel Island.....	A 1
Shepherd Bay.....	C 7	Thymen Sound.....	L 7	Walker, Cape.....	C 6	York, Cape.....	E 6



LANDS AND WATERS OF THE FROZEN NORTH

flowers have been found here. Poppies and saxifrages blossom in the extreme north of Greenland, and flowering mosses and lichens are everywhere common. Trees, chiefly dwarf willows, birches, and junipers, occur in the most southern portions, but are absent farther north. It is generally agreed among authorities that the dry winds and not the extreme cold prevent the growth of trees, as in the coldest parts of Siberia trees thrive, because there is more humidity in the atmosphere.

Mineral Wealth. In Greenland, a mineral called cryolite, long extensively used in making aluminum, and now much used in the manufacture of enameled ware, is mined; fossil ivory is obtained in Northern Russia, especially in the delta of the River Lena; and the numerous islands north of Canada contain coal of good quality. At present, difficulty of access and lack of transportation render these coal fields valueless, but a railway financed by the United States government for the purpose of developing the coal fields and copper mines of Alaska has been constructed. Gold has been extensively mined in Alaska. Petroleum is known to exist in Northern Canada.

Climate. The temperature varies considerably in different localities within the Arctic regions, but on the average it is much below 32° Fahrenheit. On the American continent, inland temperature averages 30° below zero

at the Arctic Circle. In Northern Siberia, at Verkhoyansk, the coldest place in the northern hemisphere, the winter temperatures sometimes range below -60° F. for weeks at a time. The temperature of the water of the Arctic Ocean is higher than that on the ice-covered land, varying from a few degrees above freezing point to a few degrees below that point.

Ice Formation. The ice of Arctic lands and seas constitutes much of the scenic feature of the region. In Greenland and some of the larger islands, ice has accumulated more rapidly than it has melted. This accumulation is known as *paleocrystic ice*. The great ice sheet of Greenland in places is thickly covered with fine dust having a chemical composition not unlike volcanic ash; and the material, it is thought, came from the near-by volcanoes of Iceland, having been carried hither by the winds. Very small spherules of iron also have been collected, and these, without doubt, are of meteoric origin. In the vicinity of Disko Bay, Greenland, the steep slope of the coast causes a sliding movement, or flow of the ice sheet, forming Humboldt Glacier. As the edge of the glacier is pushed into the sea, great masses of ice are broken off and float southward through Davis Strait. The icebergs thus borne into the route of trans-Atlantic commerce become a double menace. Collision with them has sent many a steamship to the bottom;

the dense fog which they help to create adds greatly to the dangers and discomforts of trans-Atlantic passenger service.

Sea ice takes various forms. The narrow shelf of ice that skirts the cliffs is called the *ice foot*. Where waves break on sandy beaches, sand is plentifully mixed with the water, and the mixed sand and ice form the *shore barrier*. The freezing of the surface of comparatively still sea water, sometimes to a depth of several feet, forms the *ice sheet*, or *ice field*. When on-shore winds become strong, the ice field is broken into blocks that are piled up and crunched against the shore, forming an *ice pack*. The accumulated force of the wind and water combined is so great that the side crunch hurls great blocks of ice several feet into the air. A ship caught in the pack is usually held for three or four months, and many vessels have been hopelessly crushed at the breaking of the pack. Detached masses floating about constitute *floes*; or, if finally broken, *sludge*. In the navigable fiords and estuaries ice sometimes forms around the anchors of vessels lying there, finally accumulating until its buoyancy causes it to rise to the surface; this is known as *anchor ice*, or *ground ice*. R.H.W.

Arctic Exploration. Few records of daring are as thrilling as those of man's exploration of the northern wastes. Until 1909 the geography of the region within hundreds of miles of the North Pole was unknown; the existence of a polar land mass was suspected. In that year Peary reached the Pole. Not again until 1926 was the spot visited, when within four days, nineteen men looked down from airships upon the exact "top of the world." (See **POLAR EXPLORATION** and its Related Subjects.)

Related Subjects. The reader is referred in these volumes to the following articles:

Glacial Epoch Northwest Passage Polar Exploration

ARCTIC SEAL, trade name for a fur. See **RABBIT**.

ARCTURUS, *ark tu' rus*, a star of the first magnitude, in the constellation of Boötes, one of the brightest stars in the northern hemisphere. It is so far distant from the earth that it takes forty years for its light to reach us, and yet it is much nearer than many other stars. To locate it, follow the curve of the handle of the Dipper; the continued line will point directly to Arcturus, the *Bear Driver*, a star of ruddy hue. F.B.L.

Related Subjects. See, in the article **ASTRONOMY**, illustration *The Heavens in Spring and Summer*. See, also, **STAR**.

ARDMORE, OKLA. See **OKLAHOMA** (back of map).

AREA, *a' re ah*, a Latin word meaning a *piece of level ground*, has come to have in English several different meanings. In arithmetic and geometry, the area of a surface is the number of square units it contains, as square

inches, square feet, etc. (see **MENSURATION**; **SQUARE**). Often the word is used to mean any open space, as, "Within this area the entire city was built." It is also applied to the open space of a narrow front yard, or a back court. The early Christians gave the name to the sections of consecrated ground in which the faithful were buried. The word is also used in describing particular parts of the cortex of the brain. The various areas of the brain are indicated in the article **BRAIN**. J.W.Y.

AREOPAGUS, *air e op' a gus*, the oldest court of justice of ancient Athens, so named because its meetings were held on the Areopagus hill, interpreted by the ancients as Hill of Ares (Mars), and located directly northwest of the Acropolis of Athens (see **MARS' HILL**). In the time of Solon, who was elected archon about 594 B.C., the court was composed of those who had once been archons (see **ARCHON**), and the term of office was for life. This court tried cases of murder, had general oversight of the morals of the people, and could fine citizens found guilty of extravagance, insolence, or any form of intemperance.

AREQUIPA, *ah ra ke' pah*. See **PERU** (The Cities).

ARES, *a' reez*. See **MARS**.

ARETAS, *ah re' tas*, the father-in-law of Herod (Antipas). See **HEROD**.

ARETHUSA, *air e thu' sah*, in Greek mythology, a beautiful nymph, daughter of Hesperus, one of the attendants of the goddess Diana, who changed her into a fountain to free her from the too ardent courtship of the river god Alpheus. But the god, changing himself into a swift torrent, still pursued her, and Diana in pity opened for her an underground passage through which she fled until she came to the upper world on the plains of Sicily. The god, however, followed her in the regions below, and, passing from Greece to Sicily, joined his loved one where the fountain sparkled under the bright Sicilian skies.

The Greeks based the pretty story on the peculiar course of the Alpheus River, which, as it flows through Arcadia toward the Ionic Sea, now and then disappears below the surface. Near the seacoast on the Sicilian plains a beautiful fountain bubbled up, and the imaginative Greeks liked to believe that it contained the waters of the Alpheus. Shelley wrote the story of Arethusa in his poem of that name.

In Botany. Arethusa is also the name of two species of the orchid family, one growing in North America, the other in Japan.

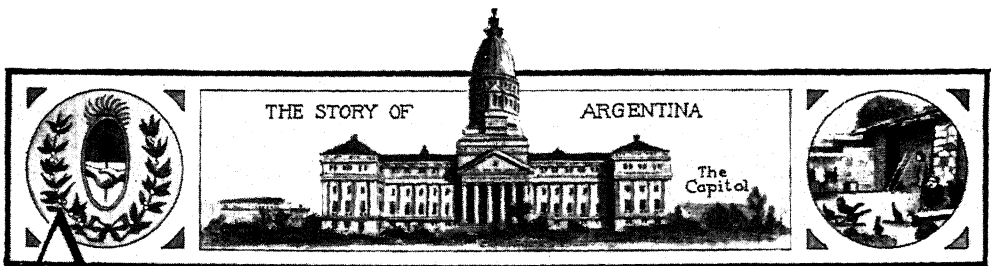
Related Subjects. The reader is referred in these volumes to the following articles:

Diana	Hesperides
Fountain	Nymph

AREZZO, *a rel' so*. See **ITALY** (The Cities).

ARGAND LAMP. See **LAMP**.

ARGENT, *ahr' jent*. See **HERALDRY**.



ARGENTINA, *ahr jen te' nah*. Among all the Spanish-American republics of South America, Argentina, officially called the ARGENTINE REPUBLIC, is the largest, the most populous, and the richest. Brazil, the great sister-republic to the north, is more than twice as large as Argentina, but Brazil is Portuguese in its origin, its customs, and its language. Argentina is also to be singled out for favorable situation; no other South American country, except Chile, is so well located as to climate.

It has 1,153,000 square miles, a larger area than all of the United States east of the Mississippi River, plus all of the states bordering that stream on the west, except one-third of Louisiana. Its population is about ten millions. When it is understood that about one-fifth of Argentina's people are in one city (the magnificent capital, Buenos Aires), it is clear that the vast expanse of the country is sparsely settled. In some entire inland provinces there is only one person to three square miles. Comparing Argentina with Canadian provinces, we find that it has over twice the combined area of Alberta and Saskatchewan, and nine times the number of people.

The People. In its population, Argentina presents a strange contrast to other Spanish-American lands. We find here a babel of European languages, a hive of human industry, a metropolis unapproached in size by any other Spanish-American city or by any city of Spain itself, or by any city in the world south of the equator, and an almost feverish striving for material wealth. The steady industry of Northern Spain, from which the early settlers so generally came, is united with the imagination and enterprise of more ambitious peoples.

Spanish conservatism is offset by a striving for the new in modern life and achievement.

More than any other country of South America, Argentina is a white man's land. The Indian and mestizo (mixed Indian and white) population, which is insignificant and perhaps does not exceed a total of 100,000, is relatively decreasing through immigration of Europeans, chiefly Spanish and Italian, but including also French, Russian, German, British, and Portuguese, in large numbers. The population continues to grow rapidly with these streams of immigration. Within the past half century Argentina has received nearly twice as many immigrants from Italy as from Spain. Two and one-third millions of Italians have been added to its citizenship. Thus far, but few North Americans have sought permanent homes there.

Argentina, like Chile, has been free from any negro problem, for it never contained any African population worth mentioning.

The Cities. Buenos Aires, the magnificent capital of the country, is described in these volumes under its title. The remaining prominent cities are discussed below.

Bahia Blanca, *bah ee' ah blang' kah*, on the bay of the same name, providing the finest harbor of the country, is the great grain port for the cereal areas. It has steamer communication with European ports, and railroads connect it with all parts of Argentina. Millions of dollars have been spent in building docks and elevators for loading grain and in dredging the channels for sea-going vessels. Excepting Buenos Aires, 450 miles northeast, Bahia Blanca is the largest wool market in the country.

The site was a trading post in 1829; the city did not begin to grow until about 1900, and it is therefore modern. Near the entrance to the harbor the government has erected Puerto Militar, a great military and naval station.

Bahia Blanca is a Spanish name, and means *white bay*. The population is slightly in excess of 50,000.

Cordoba, or **Cordova**, *kaw' dohvah*, is the capital of a province of the same name in the north-central section, northwest of Buenos Aires. There is no better grazing section in all Argentina, and Cordoba is a flourishing commercial center for quantities of livestock, wool, and hides. The surrounding territory depends entirely upon irrigation for successful agriculture, and twelve miles from the city is a great dam across the Rio Primero which furnishes an abundant supply of water. Cordoba is one of the oldest cities of Argentina; it was founded in 1573, and has a university which dates from 1613. It also has a



ARGENTINA

Location, in black, shows the proportion of the continent occupied by this great country.

well-equipped national observatory. Its population is 221,200 (1928).

La Plata, *lah' plah' tah*, is the capital of the province of Buenos Aires. It was founded in 1882, after Buenos Aires had been made the Federal capital. The city has enjoyed rapid growth, and enterprise is apparent everywhere in its well-paved streets lined with modern shops, its many fine, open squares, and its numerous public buildings. The capitol and other buildings of the provincial government, the observatory, and the railway station are especially noteworthy. Connected by harbor with the estuary of the River La Plata, it is an important seaport for the grazing regions inland. It has meat-packing industries, and manufactories of cotton and woolen textiles. Population, about 165,000.

Mendoza, *men do' thah*, the most important inland city, is beautifully situated on the slopes of the Andes, 2,500 feet above sea level, 160 miles east of Valparaiso, Chile, in a rich agricultural section. It is the center of the grape and wine industry, 100,000 acres of vines being cultivated in the vicinity. Other Mediterranean fruits, such as apricots, olives, and nuts, are grown under irrigation. The city is also the transfer point between Buenos Aires, 647 miles to the east, and the Pacific coast. Connection with Chile is by the Trans-Andean Railway. The city is progressive. It was visited by an earthquake in 1861, when 10,000 lives were lost. Population, about 59,000.

Rosario, *ro sah' ri o*, a rapidly growing city on the Paraná River, 175 miles northwest of Buenos Aires, to which it is second, both in size and in the matter of exports. Being an important port for river and foreign trade, as well as one of the foremost railway centers in the province of Santa Fé, it exports large quantities of grain, flour, sugar, wool, and meats. The city has the largest sugar refinery in Argentina. Population, about 265,000.

Santa Fé, *sahn' fah fay*, capital of the province of Santa Fé, is situated on a channel of the Paraná River, about 300 miles northwest of Buenos Aires. It is an important railway center, having connections with Rosario, Córdoba, and Tucumán. The city is modern in appearance. Shipbuilding is an important industry, and there is a prosperous export trade in wool, lumber, and cattle. Population, estimated at about 60,000.

Tucumán, *too koo mahn'*, capital of the province of the same name, lies on a plateau near the base of a range of the Andes, 300 miles northwest of Córdoba and 690 miles northwest of Buenos Aires. In Tucumán, on July 9, 1816, was signed Argentina's declaration of independence. The city is substantially built, and has well-paved streets and attractive dwellings. Among the principal features are a modern cathedral and a national university, the latter founded in 1912. The city is the center of a sugar-plantation district, and is steadily growing in commercial importance. There are several local manufactories, principally sugar refineries. Population, about 92,000.



Photo: U & U

ARCHITECTURE IN SPANISH STYLE

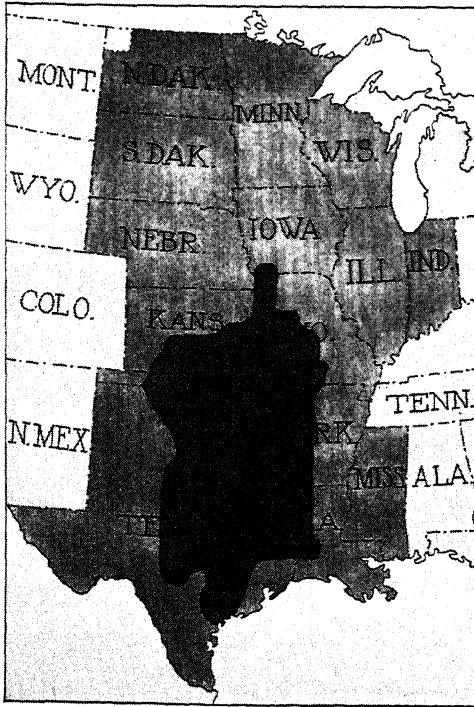
The buildings shown are in the capital city, Buenos Aires. At the top is the branch of the First National Bank of Boston, Mass.; below is the National Bank of Argentina.

vesting. It lies wholly south of the equator, its northern boundary being 22° south latitude, and its southern 55° south. If a map of Argentina is folded over a map of North America, drawn on the same scale, Argentina's northern boundary will touch Havana, and the island of Tierra del Fuego (part of which Argentina owns) will reach to Hudson Bay.

It is a natural supposition, then, that the range of climate of this southern republic would average well with that of the United States and Lower Canada, and that those industries which thrive in North America would be the leading ones in Argentina. These conclusions are largely true, particularly with respect to prod-

ucts, but there are certain climatic differences worthy of note.

The North American continent in the latitude of Labrador is cooled by the down-flowing Labrador Current from the icy Arctic regions; part of the Southern Argentina coast (the



GRAIN ZONE

The lightly shaded section indicates Argentina's total area as compared with the United States. The heavily shaded section represents the proportion of the total area on which various grains are raised. In South America this extends from 28° S. to 41° S., corresponding roughly to the distance from Galveston to Central Kansas and from the center of Arkansas and Louisiana to Central Texas. It is thus seen that Argentina's wheat lands extend only to 41° S., while, by contrast, Canada's wheat area extends to about 55° N.

Northern Patagonia section) is modified in temperature by the Equatorial Current (still warm when it reaches the far southern latitude), which makes possible a vast southern area suitable for stock-raising. However, to offset this advantage somewhat, cool winds blow across the lofty Andes Mountains from the west. Much of the lower third of the country is arid, because the winds from the mountains lose their moisture before reaching the plains. This is also true of a wide belt running the entire length of the country bordering on the lofty western mountain ranges. The elevation of the land ranges from sea level, along the east coast, to several thousand feet, in the Andes, on the west, and has an average of

about 2,000 feet in the minor ranges which are a part of the Andean system. The vast fertile plain sloping from these highlands eastward toward the sea is known as the *pampas*; they provide rich pasture, highly productive for cereal grains.

The rainfall is over sixty inches in the east, decreasing to as little as two inches in the plateau region. With one exception, the Uruguay, the rivers of the republic flow southeast or east; the direction of the Uruguay is nearly south, along the eastern boundary. Three of the rivers, the Paraguay, Uruguay, and Parana, form the great La Plata system (see PLATA, RIO DE LA).

Industrial Life. Argentina is a prominent factor in the world's commerce. The grazing and agricultural possibilities are still in the process of development. The plains are ample for the raising of many millions of head of cattle and sheep. The shipment of frozen meats and livestock products, such as hides and wool, has assumed enormous proportions. Great Britain receives much the larger part of this, but shipments to the United States are growing rapidly. There are numerous freezing and chilling establishments for meat. Argentina was the first country to send frozen meat to Europe, and its salting of meats is declining. Three North American firms engage in meat packing.

Wheat is a great crop in Argentina, and the acreage is rapidly increasing. About 10,000,000 acres are in this cereal, and millions of bushels are exported annually to Europe. Of corn, the second crop in importance, there are annually over 10,000,000 acres under cultivation. Next in importance are flax, of which Argentina produces and exports nearly one-half of the world's supply, oats, barley, and rye. Cotton, sugar, grapes, and tobacco are cultivated in the torrid north. Alfalfa is grown extensively for hay and pasture. Meat and agricultural products constitute the chief export trade of Argentina. Aside from meat refrigeration and flour milling, there is little manufacturing done as yet, and most of the foodstuffs, textiles, and machinery are imported.

Almost all minerals needed for industrial development lie in the mountains of Argentina; coal, iron, and tin exist in paying quantities, but there has not been much development of these resources. The production of petroleum is a rapidly growing industry, and amounts to as much as 1,400,000 cubic meters in one year. Of this amount, the government oil fields produce more than 822,000 cubic meters; the remainder is in the hands of private corporations. Gold, silver, and copper are mined to some extent. The forests of the Chaco region west of Paraguay are exploited for their valuable timber for foreign trade.

Communication. The distance from Buenos



Photo: O R O C

CORN-SHELLING IN THE AGRICULTURAL DISTRICTS

The cobs are stored in stacks bound with sticks, wire, and corn stalks, and are used for fuel.

Aires to New York, 4,370 miles, is covered by steamers in about twenty days; about the same time is required for a trip to Liverpool. There are regular mail steamers from and to each of these cities. The trip from Rio de Janeiro is made by steamboats in about five days. The many rivers, and particularly those of the La Plata system, encourage commerce, because they are navigable for several hundred miles into the interior and unite to a degree the business interests of Argentina, Paraguay, and Uruguay. The bulk of the commerce of the country enters and leaves by the Rio de la Plata, and Buenos Aires is the center of nearly all the trade. But the best natural harbor, by far, is 450 miles southwest, at Bahia Blanca.

In 1860 Argentina possessed six miles of railroad; there are now about 23,000 miles. Most of the business enterprises requiring large investments of capital are in hands of Europeans and Americans; the common background, racial, historical, religious, and the similarity of interests in speech, social customs, and sentiments constitute a bond of sympathy which cannot but influence economic relations.

Education and Religion. Spanish traditions and Roman Catholicism are inseparable. The Roman Catholic religion is in part supported by the government, but there is freedom of other worship. Before 1884 only Church marriages were legal; in that year civil marriage was legalized. Education of children

from six to fourteen years of age is compulsory, and an improved system of free secular schools is making its influence felt. The government is yearly adding largely to its expenditures in this direction, and the illiterate population of fifty-five per cent in 1905—which was less than in several of the countries of Europe—was reduced to about one-third by 1929. There are more than eighty normal schools for the training of teachers, five national universities and numerous colleges, 10,225 public schools, national and provincial, also institutes for the defective, vocational schools, and art academies. The national observatories at Cordoba and La Plata enjoy a reputation in Europe and America.

Government. Argentina is a Federal republic, whose Constitution, adopted in 1853 and twice



Photo: O R O C

AWAY FROM THE CITIES

The character of the Indian population is depicted in this family group.

amended, is in many respects similar to that of the United States. The President is chosen by electors, and serves six years; both he and the Vice-President must be Roman Catholics, and neither can be re-elected for the following term. The legislative department comprises a Congress, of which the Senate, with thirty members, and the House of Deputies, of 158 members, are the two branches. Senators serve nine years; Deputies, four. The country is divided into fourteen provinces (states), ten territories, and one Federal District (Buenos Aires). Each province elects its own governor and legislature,

and has full control of local affairs. The territories are administered by governors appointed by the President, and the Federal District by a mayor, also appointed by the President.

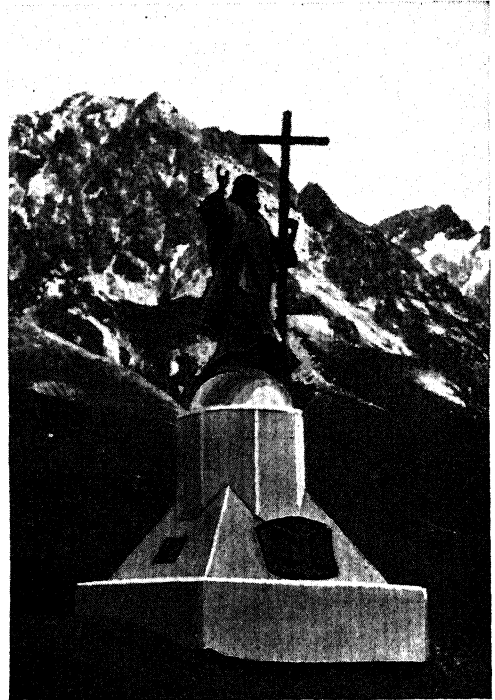
History. The region of Argentina was first visited in 1515 by Juan de Solís, who ascended the Rio de la Plata in search of a passage to the East Indies. Sebastian Cabot, commanding a Spanish expedition in 1526, named the La Plata River, and founded upon its banks a colony which Spain at once claimed and developed as a dependency of Peru. In 1776 some semblance of home rule was granted to the La Plata colonists; but Spanish rule was oppressive, and in 1816 the colonists declared their independence. Years of war and disorder followed, continuing until 1852. In the following year, the present Constitution was adopted, and the first President of the new republic was elected. From 1865 to 1870 Argentina was allied with Uruguay and Brazil in a war against the Paraguayan dictator, Francisco Solano Lopez, who was finally suppressed.

In 1878, the President of the United States, Rutherford B. Hayes, chosen as international arbiter, settled the boundary between Argentina and Paraguay, making the Pilcomayo River the dividing line. The credit of Argentina declined from 1886 to 1890 under a reckless and scandalous administration. The great banking house of Baring Brothers, in London, financial agents of the Argentine government, failed in 1890, and a financial panic swept over the republic. The President was compelled to resign, and his term was completed by the Vice-President. Dr. Saens Peña, who was chosen in 1892, was an able jurist, but failed as an executive, and resigned in the third year of his term, being followed by the Vice-President, Uriburu, in orderly succession. An event of President Peña's term was the settlement by President Grover Cleveland of a disputed boundary, making the Pequiry River the line of demarcation through the disputed border. The western boundary of Argentina was settled permanently, it was believed, by the arbitration of the United States minister, in 1898, and the question of ownership of the south end of the continent was happily arbitrated by King Edward of Great Britain. The beginning of a lasting peace, with the settlement in 1902 of the long, troublesome boundary disputes with Chile, was marked in a singularly impressive manner by the construction of the famous monument and statue known as the *Christ of the Andes*.

[There is no other statue in the world so significant of peace and commerce as this one, which marks the boundary line between Argentina and Chile. So long as the countries quarreled over their boundary and other matters, there could be no effective coöperation in the great work of interoceanic railway construction

and maintenance. It was an Argentine lady, Señora Angela de Costa, who conceived and urged the plan of erecting on the sublime eminence an enduring figure of the Saviour of men, to solemnize the pledges upon which the future peace was based. And then, after forty years of thwarted effort, the desired international coöperation began.]

During the World War the sympathies of most Argentinians were strongly on the side of the allied nations, but sentiment was sharply



CHRIST OF THE ANDES

The great Peace Statue erected jointly by Argentina and Chile. In his book, *South America, Observations and Impressions*, Hon. James Bryce made this note of the act and of the spirit of the two countries: "On the level summit of the pass stands the Christ of the Andes, a bronze statue of more than twice life size, standing on a stone pedestal rough hewn from the natural rock. . . . There had been a long and bitter controversy between Chile and Argentina over the line of their boundary along the Andes, a controversy which more than once had threatened war. . . . After years of careful inquiry, an award was delivered and a boundary line drawn in which both nations acquiesced. Grateful for their escape from what might have been a long and ruinous strife, they cast this figure out of the metal of cannon, and set up here this monument of peace and good-will, unique in its place and in its purpose, to be an everlasting witness between them."

divided in parts of the republic because of the presence of a great colony of Germans, numbering over 65,000, which had been planted there to influence trade and politics favorable to the German Empire. There was a strong organization for German propaganda, while allied propa-

OUTLINE AND QUESTIONS ON ARGENTINA

Outline

I. Position

- (1) Latitude; (2) longitude; (3) boundaries

II. Size and Shape

- (1) Length, 2,200 miles
 (2) Breadth, 1,000 miles in north to 200 miles in south
 (3) Area, 1,153,000 square miles
 (4) Comparative size
 (5) Wedge-shaped

III. Surface

- (1) Vast, flat plain in east
 (2) Interior highlands
 (3) Plateau and peaks in northwest

IV. Drainage

- (1) Easterly flowing rivers
 (2) Salt marshes in central provinces

V. Climate

- (1) Temperate
 (2) Climatic differences compared with United States
 (3) Arid regions and rainfall

VI. Products and Industries

- (1) Stock-raising
 (2) Agricultural products
 (3) Mining

VII. Inhabitants

- (1) Language and characteristics of the people
 (2) Small rural population; cities
 (3) Immigration
 (4) Roman Catholic religion
 (5) Education; decrease in illiteracy

VIII. Transportation and Commerce

- (1) Communication with North America
 (2) Buenos Aires and other ports
 (3) River navigation
 (4) Railroads
 (5) The North Americans' part in the business of Argentina

IX. Government and History

- (1) A republic
 (2) Early exploration
 (3) Colonial government of Spain
 (4) Independence
 (5) Political struggles of the republic
 (6) Boundary difficulties with Chile and Paraguay

Questions

- Why does the country near the Andes have but little rainfall?
 Has the country an extensive coast line?
 How is Tierra del Fuego cut off from the rest of the country?
 What are Argentina's two great crops?
 What are the meanings of Argentina, La Plata, Buenos Aires?
 What places in North America have latitudes equal to those of the north and south extremes of Argentina?
 What minerals are there in the country?
 What is the largest city in the southern hemisphere?
 How important is the cattle industry?
 Does the country rank high as a producer of flaxseed?
 How does the Constitution resemble that of the United States?
 Are there many railroads?
 Is the country thickly settled?
 What is a *mestizo*?
 What are the *pampas*?
 Is Argentina the largest nation in South America?
 What significance has a certain monument in the Andes?
 How important is the negro problem?
 What language do the people speak?
 During the last half century, from which European country did most of the immigrants come?

ganda was largely lacking. The country remained neutral. After the war, it joined the League of Nations, but later withdrew support.

The economic and industrial development of the country is its chief present problem. Loans for this purpose from the United States are supplementing European interests and establishing a growing amity between those countries. E.H.S.

Related Subjects. A more detailed knowledge of Argentina may be gained from a study of the following articles:

LEADING PRODUCTS

Alfalfa	Meat
Cattle	Sheep
Corn	Wool
Flax	

MOUNTAINS

Aconcagua	Andes
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RIVERS

Paraná	Plata, Rio de la
Pilcomayo	Uruguay

UNCLASSIFIED

Buenos Aires	Patagonia
Pampas	Tierra del Fuego

ARGENTITE, *ahr' jen tite*. See SILVER (Sources).

ARGOL, *ahr' gahl*. See CREAM OF TARTAR.

ARGON, a gas which is found in the atmosphere, of which it forms only about eight-tenths of one per cent. It is a chemical element and its symbol is *A* (see CHEMISTRY). Its presence in the air was suspected for a long time, but it was discovered only in 1895 by Lord Rayleigh and Sir William Ramsay. It is a colorless and odorless gas, and seems to possess no chemical properties by which it can unite with other substances; therefore, no compounds have been discovered. Argon has been reduced to a liquid and a solid. Mixed with nitrogen, it is used as a gas for electric-light bulbs. T.B.J.

ARGONAUT, *ahr' go nawt*, a small mollusk, named for the sailors on the *Argo* (see ARGONAUTS, below); it was popularly supposed to

but the female is eight or ten times as large and has a fluted, spiral shell, called the *boat*. This little animal is the *paper nautilus*, of which poets have often written, and it is especially well known through Oliver Wendell Holmes's *The Chambered Nautilus*. In this poem, however, Holmes confused the chambered nautilus with the little argonaut, or *paper sailor*, for the latter has not a chambered shell and is not a true nautilus. The lines on the "ship of pearl" which "sails the unfathomed main" apply to the legend regarding the argonaut, while the rest of the poem refers to the real nautilus (which see). S.H.S.

Scientific Name. The scientific name of the argonaut is *Argonauta argo*.

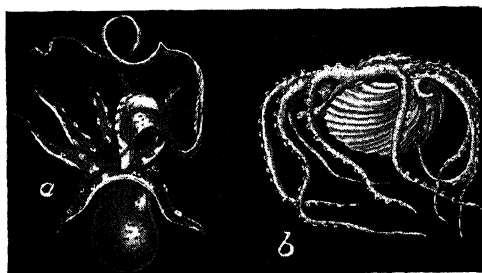
ARGONAUTS, *ahr' go nawts*. One of the favorite stories in Greek mythology is the tale of the Argonauts, a band of young heroes who sailed with Jason in the ship *Argo*, in search of the Golden Fleece. Jason was the son of Aeson, king of Iolcus in Thessaly. When Aeson grew wearied of his kingly duties, he gave up the crown to his brother Pelias, stipulating that Jason should have the throne on becoming of age. The uncle apparently was willing to yield to his nephew when the time arrived, but with hidden purpose he painted in glowing words the glory and fame that Jason and his companions would win by seeking the Golden Fleece, which was guarded by a dragon in the far-off land of Colchis, on the shores of the Euxine (Black Sea).

With high hopes, the band of young heroes set sail in the *Argo*, which had been made especially for them. Among Jason's companions were Orpheus, Castor and Pollux, Hercules, and Theseus. At Colchis, which they reached after many adventures, they secured the help of Medea, daughter of the king. Using her powers of sorcery, the princess put the dragon to sleep, and after Jason had captured the Golden Fleece, she went back to Thessaly with him.

Related Subjects. In these volumes are given the stories of Jason and the heroes who accompanied him. See, also, MEDEA; GOLDEN FLEECE.

ARGONNE, *ahr' gahn*, THE, a rocky, heavily wooded plateau in Eastern France, lying west of the Meuse River between Rheims and Verdun (nearer the latter). It was the scene of intense fighting at various times during the World War, but particularly in the last three months of 1918, preceding the Armistice.

The Argonne had been held by the Germans for four years, and was so well fortified that it was regarded by them as impregnable. The attack on this sector was a part of the general allied plan for the breaking of the Hindenburg Line; its particular objective was the capture of Sedan and the severing of the main line of communication between Germany and its armies in France and Belgium.



ARGONAUT

Illustration shows (a) male, (b) female. Though the two are here drawn nearly the same size, the male is actually only about one-eighth the size of the female.

sail on the surface of the sea with its two webbed arms for sails. The male is very inconspicuous—not more than an inch in length;

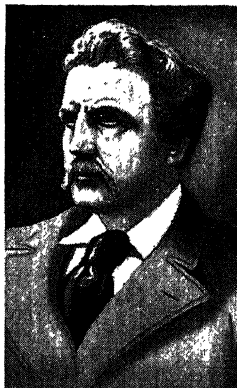
In the Argonne-Meuse campaign, which had three distinct phases and lasted from September 26 to November 6, 896,000 American soldiers took part, a larger number than had ever before been engaged in one military operation. They were under command of General Pershing, who cooperated with General Gouraud, in charge of French troops. Most of the desperate fighting in this sector was of a hand-to-hand variety. The campaign ended on November 6, with the capture of Sedan, and is considered one of the decisive factors that forced the capitulation of Germany. See WORLD WAR (1918, The Last Days).

AR'GUN RIVER. See AMUR RIVER.

ARGUS, in Greek mythology, a fabulous creature known as the *all-seeing*, because he had a hundred eyes. This monster was placed by Juno to guard Io, whom she hated, but Mercury induced a deep sleep to fall upon him and then cut off his head. Juno then placed his eyes in the tail of her favorite bird, the peacock, where they may still be seen. See IO; JUNO; MERCURY.

Modern Significance. The term *argus-eyed* is applied to one who is exceedingly watchful.

ARGYLL, *ahr' gyle*, JOHN DOUGLAS SUTHERLAND CAMPBELL, ninth Duke of (1845-1914), an English statesman and author, better known, perhaps, as the MARQUIS OF LORNE. In 1868 he was sent to Parliament, where he represented Argyllshire for ten years. He married in 1871 the Princess Louise Alberta, fourth daughter of Queen Victoria. The Canadian province of Alberta was named for her. From 1878 to 1883 he was Governor-General of Canada, and his administration was exceedingly popular; from 1895 to 1900 he was a leading Unionist member of the House of Commons.



NINTH DUKE OF ARGYLL
(Marquis of Lorne.)

ARIADNE, *air i ad' ne*, in Greek mythology, a daughter of Minos, king of Crete. When Theseus came to Crete and undertook to slay the Minotaur, Ariadne gave him a twist of thread, of which she held one end. This he unwound as he entered the labyrinth, and by following it back found his way out after his victory. He fled from the island secretly, taking her with him, but deserted her on the Isle of Naxos, where she was found and married by Bacchus.

Related Subjects. The reader is referred in these volumes to the following articles:

Bacchus
Labyrinth

Minotaur
Theseus

ARID, *air' id*, **REGION**, a dry area with no rainfall, or a quantity so small that a good growth of vegetation cannot be sustained. The word *arid* literally means *dry*, or exhausted of moisture. A desert, therefore, is an arid region. The name is frequently applied to that portion of North America which does not have enough rainfall for the successful raising of crops. This region comprises parts of the Western plains, including parts of Alberta and Saskatchewan and the states of Montana, Wyoming, Colorado, Utah, Nevada, Arizona, and New Mexico, the western portion of the Dakotas, Nebraska, and Kansas, the northern part of Texas west of the 100th meridian, and a portion of Southern California.



ARIADNE ON THE ISLE OF
NAXOS

From the painting by Rae.

Another nearly arid region, smaller in extent, is found in Oregon and the southeastern part of Washington, extending into Idaho. The area of the arid and semi-arid region of North America is nearly two million square miles, of which about three-fourths are in the United States. Large portions of this region receive sufficient rainfall to support a growth of good grass for grazing purposes, and it is more accurate to call such parts *semi-arid*. In the arid region of North America, and in almost all similar sections in other parts of the world, the soil is fertile, and when supplied with water produces abundant crops.

R.H.W.

Related Subjects. The reader is referred in these volumes to the following articles:

Desert Dry Farming Irrigation

ARIEL, *a' ri el*. See GAZELLE.

ARIES, *a' ri eez*, **THE RAM**, the first sign of the zodiac and the name of a constellation. The zodiacal sign of Aries includes the first 30° of the ecliptic from the vernal equinox, or the point at which the sun crosses the equator in the spring. The sun at the time of crossing is said to be "in the first of Aries," but owing to the westward motion of the equinoxes the sun actually is in the constellation Pisces at the vernal equinox (see PRECESSION OF THE EQUINOXES). The symbol of Aries is ♈, representing the horns of a ram or the nose and eyebrows of the human face. See ZODIAC; and for illus-

tration of the constellation, ASTRONOMY (The Heavens in Autumn and Winter). F.B.L.

ARISTA, *a rees' tah*, MARIANO (1802-1855), a Mexican general who ranks not lower than third among Mexico's great men, regarded by some as second to Porfirio Diaz. He took part in the war that secured Mexican independence, and in 1836 was second in command to the dictator Santa Anna, whom he excelled in constructive ability. During the war between Mexico and the United States, Arista led the Mexican forces at Palo Alto and Resaca de la Palma, and was badly defeated in both battles by General Zachary Taylor. In 1850 he became President of Mexico, but his term of office was troubled, and he resigned in 1853. Soon afterward he was banished by Santa Anna, who had stirred up a revolt against him, and he died in exile in Spain. See MEXICAN WAR.

ARISTIDES, *air is ti' deez* (about 500-467 B.C.). During the period when Athens was at the height of its glory, Aristides was one of the foremost Athenian statesmen and military

taining the highest civil office in Athens. Though he was so upright that he was known as "The Just," his rival Themistocles secured his banishment, in 483, by accusing him of being an enemy of democracy. In connection with this episode the following story is told:

During the vote as to his banishment, an ignorant citizen approached him and asked him to write the name Aristides on a shell. When Aristides asked his reason for wishing to banish an innocent person, the man replied, "It's that I am so tired of hearing him called *The Just*." This story, whether or not it is authentic, indicates his reputation for integrity in his public relations.

Still loyal to his country in his exile, Aristides urged the Greek cities to prepare for another Persian invasion, and when the approach of Xerxes' army, in 480, brought about a general amnesty, he hastened to the aid of Themistocles and had a large share in the victory of Salamis; thereafter, Aristides was a leader in public affairs until his death. So poor was he that the state bore the expense of his burial and provided for his children.

Related Subjects. The reader is referred in these volumes to the following articles:

Marathon
Miltiades

Salamis
Themistocles

ARISTOCRACY, *air is tok' ra see*, a form of government in which control rests in the hands of a few citizens prominent for their wealth or family prestige, or both. The term literally means *government by the best*. In former times the aristocracy, where it existed, stood midway between an absolute monarchy, in which one man exercised supreme authority, and a democracy, in which authority was shared by all citizens. Theoretically, the men best qualified governed in the interests of all the people. In practice, however, the governing classes frequently consulted only their own interests, thus establishing an *oligarchy* (which see). Athens and Sparta at various times, and Rome for two centuries before the formation of the empire, were true aristocracies; they were neither despotic nor ruled by the mob. In modern use, the word has a wider meaning, equivalent to the *best*; thus we speak of an aristocracy of brains, of wealth, and of birth. See GOVERNMENT.

ARISTOPHANES, *air is tof' a neez* (444-380 B.C.), the greatest writer of comedy in ancient Athens. His plays were in poetry, and of the forty which he wrote, eleven have survived. These comedies give a picture of the political and social conditions of Athens in his time. He was not afraid to ridicule such well-known men as Alcibiades and Socrates (which see), though his later plays are less personal than the earlier ones.

Aristophanes was a master of language and rhythm, and his songs and chants show his



Photo: Visual Education Service

THE PEASANT EXPLAINS HIS VOTE

Aristides learns why one man is opposed to him.

leaders. In 490, Darius of Persia sent a great army to Greece in an effort to conquer the country; his forces were severely defeated at Marathon, because the Greeks followed the advice of Aristides and gave the command to Miltiades. Before this, it had been the custom for each of ten generals, in succession, to direct the army for one day. After the victory of Marathon, Aristides became archon, thus at-

richness of imagination. His plays are remarkable for wit, rollicking fun, originality, and mocking satire.

What He Wrote. Of the plays that have come down to us, the most important are *The Knights*, *The Clouds*, in which Socrates is ridiculed, *The Wasps*, *The Birds*, and *The Frogs*, the latter a satire on Euripides.

ARISTOTLE, *air is tot' 'l* (384-322 B.C.). This greatest of ancient philosophers, and the creator of natural science, was the pupil of Plato and the teacher of Alexander the Great. Seldom in history do we find such a union of names, for each belongs to a personage who made a distinct and lasting impression on civilization.

Aristotle was born in Stagira, a Greek colony in Thrace. His father was court physician of Amyntas II, king of Macedon, whose son, Philip II, completed the subjugation of Greece in 338 B.C. and paved the way for the exploits of his own son, Alexander. Aristotle received a good education at Stagira, and in his eighteenth year went to Athens, where, for the next twenty years, his natural mental gifts expanded under the influence of Plato's teachings and writings. Plato called his brilliant pupil the "intellect of the school," but was unable to mold his mind. Aristotle was an original thinker, and he disagreed with some of his beloved teacher's most cherished theories.



ARISTOTLE

After the death of Plato (347), Aristotle spent three years at the court of his friend Hermias, tyrant of Atarneus, in Asia Minor, and subsequently married the latter's sister, Pythias. In 343 he was called to Macedon to take charge of the education of the young Prince Alexander, then a lad of thirteen. For three or four years he conducted a school near the capital city of Pella, Alexander being one of several pupils of noble or royal blood. To what extent Aristotle influenced that restless, ambitious nature is a matter of dispute. It is significant, however, that after his conquest of Persia, Alexander gave his former tutor great sums of money to aid him in his scientific researches, and at one time placed at his disposal the services of a thousand men scattered throughout Asia and Greece. These were instructed to collect specimens and make accurate reports of their observations of animal life.

At the age of fifty, Aristotle returned to Athens and set up a school in the Lyceum, a

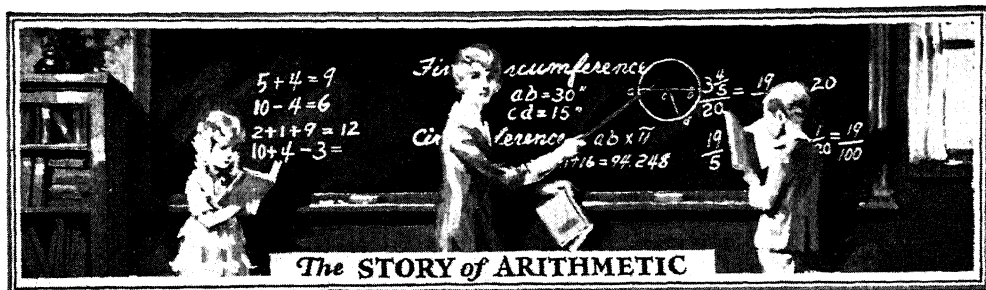
gymnasium in the suburbs. Because lectures were given in a shady walk, and also because, as was customary, the master and his pupils studied and discoursed while walking up and down, Aristotle's organization became known as the *Peripatetic School of Philosophy*; the name *peripatetic* is from the Greek for *walk*. Here he remained until Alexander's death in 323, a period nearly coinciding with the conqueror's reign. Because the Athenians suspected him of hostility toward the reestablishment of Greek independence, Aristotle was made to feel that his life was in danger, and he fled to Chalcis, in Euboea, where he died within a year. He had been a devoted husband and father, and in his will, as quoted by later historians, he made thoughtful provision for his son and daughter.

Aristotle's system of philosophy differs from Plato's, primarily in that the former places the emphasis on established fact, and the latter on the imaginative will. Says H. G. Wells in *The Outline of History*:

He [Aristotle] anticipates Bacon and the modern scientific movement in his realization of the importance of ordered knowledge. He set himself to the task of gathering together and setting down knowledge. He was the first natural historian. Other men before him had speculated about the nature of things, but he, with every young man he could win over to the task, set himself to classify and compare things. Plato says in effect: "Let us take hold of life and remodel it"; this soberer successor: "Let us first know more of life, and meanwhile serve the king."

What He Wrote. Aristotle left to posterity a large volume of writings, of which a portion has come down to us. Of extant works the most important are *Logic*, *Rhetoric*, *Poetics*, *Physics*, *Metaphysics*, *Ethics*, *Psychology*, *Politics*, *History of Animals*, and *Meteorology*. The effect of his teachings has been felt in all modern philosophy. See PLATO; ALEXANDER THE GREAT; EVOLUTION.

ARISTOXENUS, *air is toks' e nus*, a Greek of the fourth century B.C., who was the greatest student of his day in the subjects of music and rhythm. He elevated these into a science. Aristoxenus was born into a scholarly family; his father, Spintharus, had been a pupil of Aristotle, and as he was well informed on musical lore of the times, he encouraged his son in the latter's ambition. Aristoxenus hoped to be the successor of Aristotle and to be placed at the head of his school, but the appointment was given to Theophrastus. Though disappointed, he remained in Athens and enriched its scholarly life. He is said to have written more than 450 treatises on music, philosophy, and morality. He extended his theories on music into investigations into the nature of the soul; he held the soul to be a sort of "tuning of the body." Only one of his treatises has survived, and it is incomplete; this is his *Elements of Harmony*.



The STORY of ARITHMETIC

ARITHMETIC. Why must we study arithmetic? Why does it hold an important place in the list of school studies? Investigations by teachers and business men have shown that never before has there been such widespread need of arithmetical knowledge, because there is no other subject that is so closely connected with everyday needs, and because widening fields of labor demand more and more a practical understanding of *figuring*, or working with numbers and number relations.

What does the world demand of boys and girls at the age of fourteen, sixteen, or eighteen, who leave school to become workers? The need of employers in every line of work is for employees with a good general knowledge of arithmetic. It cannot be too plainly stated that the young person going into the "working world" will have the best opportunity who carries with him a knowledge of arithmetic. It is the key to the ordinary problems which will confront him daily.

We must study arithmetic, then, because it is a very practical subject—indeed, the most practical branch in all school work. You may read somewhat haltingly and without true inflection; you may be pardoned for occasional errors in speech, but the exact science of numbers as developed in arithmetic demands accuracy and precision. This is the reason that dozens of pages in this set of books are devoted to a clear and intelligible explanation of every department of arithmetic.

Besides the practical value of the subject, there is an important *cultural* value, which, it is true, is of secondary importance, but yet worthy of attention. Both phases are discussed below.

The Practical Value of Arithmetic. As the years go by for the boy in the industrial world, he desires to advance, and father and mother earnestly share this ambition. According to their ability, they have given him, during the years they have sent him to school, the tools he needs to work with. Sometimes it has been discovered that he is equipped but poorly and that he lacks some vital knowledge. He may have begun in the machine shop; in the laboratory of some large plant; in the office of an engineer or contractor. He finds almost in-

variably that to get toward the top he must have more mathematics. If he has a good foundation in arithmetic, he may easily take up algebra or geometry, and so prepare to make headway in his work.

For all mechanical work, all structural work, civil, mechanical, electrical, much mathematics is required. The laying out of streets, lots, farms, gardens, roads; the building of bridges, canals, railroads, sewers, skyscrapers, subways, all require mathematics—to survey the ground, to experiment in strain and stress, and thus suit material to the demands of the situation and avoid accident and loss; to insure safety of life and property; to estimate costs, and so on.

Chemistry is making new and large demands upon mathematics. The boy who goes into a laboratory of a large manufacturing plant needs fair control of arithmetic—of common and decimal fractions, ratio, percentage—while he is doing the simple work of a novice working by formulas. For a few years he does this initial work, gets fair wages, and feels successful. But soon he looks forward to advancement, to become a leader, a *maker* of formulas, not a *follower* only, and finds that to advance he must have more mathematics; if he has had a good foundation in arithmetic he can easily take up the advanced work. Every mother should be proud to know that each hour she devotes at home guiding the uncertain steps of her children into the field of arithmetic she is making an investment that will return in later years a hundredfold.

Boys going to work in railroad yards, railroad offices, express offices, and so on, report that there is a very sharp demand upon them for clever manipulation of figures. They find the same if they enter one of many of the various departments of government works—the water department, the department of public works, the department of health, the offices of the various inspectors, etc. The farmer boy, who will operate his own farm some day, ought to know how to reduce many of his problems to figures. Guesswork on the farm is expensive. How much stovewood is in that standing tree? How much lumber will be required for a corn crib to hold 500 bushels? How shall he prepare



**All need
ARITHMETIC**

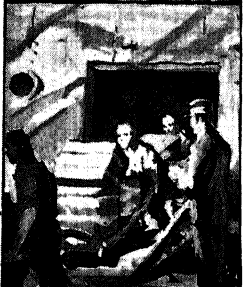
rations for farm stock to get the best feeding results? Does his poultry pay a profit? How will he determine whether his neighbor with a silo has a financial advantage over him?

Some grocers own computing scales, which automatically show the value of a purchase. The boy in a less progressive store will find his chances of continued employment brighter and his work easier if he so commands mathematical knowledge that he can solve mentally his hundreds of problems daily. A stubby pencil and peevish, waiting customers seldom give the clerk serene and tranquil poise.

The growth of scientific investigation and the consequent keeping of statistics and setting forth to the public the results of this varied investigation have enlarged the use of arithmetic and opened positions to boys and girls who need to be alert and capable in the use of figures. More and more are young people turning to civil-service pursuits. That broad field is particularly inviting, but one will hardly get in, much less stay in, without a good knowledge of the fundamentals which underlie arithmetic. For example, the department of health gathers extensive statistics from which it draws conclusions of incalculable value to physicians and to the public. Board of education census bureaus, bureaus of public welfare, and public workers in sociology do extensive work in statistics. The water department must figure the capacity of pipes, the flow of water, the number of cubic yards of dirt to be excavated, the cost of material and labor for laying pipes, etc.

Government departments employ scores of thousands of clerks whose positions are secure as long as they are competent to perform their tasks—and there is need of simple arithmetic and quickness in applying it in nearly every office. Even the Department of State, given almost wholly to diplomatic affairs, demands mathematics in its consular reports. The Department of Agriculture, with its many bureaus, has large forces at work on statistics and percentages. The Bureau of Weights and Measures keeps employed numbers of workers in simple arithmetical computations, as well as in advanced mathematics. The employees of the Interstate Commerce Commission are largely occupied with figures. There is therefore a tremendous demand for arithmetic and more advanced mathematics. It would seem true quite beyond dispute that the science of numbers underlies conditions in every walk of life where people seek to earn their living. The demand appears where many of us least expect to find it.

At the present day, the scientific trend of thought and the vast growth of industrial life are calling urgently for mathematics—simple, accurate arithmetical computation—as well as the most complex mathematical conclusions.



**All need
ARITHMETIC**

Boys and girls, therefore, who desire to be equipped well for the demands of industrial life, to fill satisfactorily the positions of beginners and business novices in the first months and years after leaving school, and to progress as the years go by, should go out from school (if they must leave early) with a good knowledge of arithmetic; they must work with assurance, accuracy, and some fair degree of rapidity, in addition, multiplication, subtraction, and division; they must also work easily with common fractions, and possess a knowledge of how to attack large ones, if they meet them; the decimal fractions must be, in their hand, a tool in perfect control. (The decimal fraction is supplanting the common fraction in all scientific work, investigation, and experiment, and very largely in industrial work.) They must be familiar with ratio and percentage, which form a great part of the arithmetic of commercial as well as scientific computations; they must have at hand the means of estimating and measuring accurately, and lastly, they must be prepared to go on with advanced work in mathematics.

Culture Value of Arithmetic. Arithmetic is a logical exercise which strengthens and invigorates the mind. The student may reason clearly and demonstrate to his perfect satisfaction all arithmetical relations; he need not accept them on tradition nor on the authority of his textbooks. Very early in the study, the student finds immutable laws, with which he must work in accord; for example, he finds by experiment alone or with his class that the area of a circle is 3.1416 times as great as the square built upon the radius of that circle. He cannot change this, nor ignore it; it is a law, a truth. He learns to respect law, to reason in accordance with it, not only in the classroom but outside of it. This cultural value comes from arithmetic only in the degree the student is allowed to experiment and investigate and discover for himself the arithmetical truths through his own solutions and methods.

The schools are coming to allow more freedom in this direction than they formerly did. Teachers are permitting students to experiment with problems, are allowing and encouraging individual research methods of solution, even in the early grades. Students are consulting persons in the business world and in the mechanical and technical industries, and bringing back into class such information as they have gained by observation and inquiry. The teachers urge students to investigate as far as they can personally, and then consult with persons who have special and expert knowledge upon the arithmetical situation under consideration in the classroom. This tends to socialize arithmetic by bringing together persons interested in the same subject. It gives the student respect for parent, neighbor, or friend who knows

practically the thing which he is studying, and in turn the public comes to understand and respect the school. J.W.V.

Present-day Tendencies. During the past few years, the study of arithmetic has received a great deal of attention from teachers and educational authorities. Investigations have been made by committees of educational associations, departments of education in universities, and the United States Bureau of Education. The results of this work have been published in the various Yearbooks of the Department of Superintendence of the National Education Association. The following points represent some of the outstanding features of these reports, and show the point of view of current arithmetic teaching:

1. The work should be based on the need of children for a knowledge of number, and should equip them to solve the problems which they will meet in life. This implies that the approach to the various topics shall be concrete rather than abstract, and that the manipulation of figures shall not become an end in itself. Typical life situations should be presented which involve numerical values and which furnish a basis for arithmetical processes, such as buying articles at a store, keeping a savings account, telling time, scoring games, and so on. Abstract drill is necessary, but not merely for the sake of drill.

2. Mathematical material and processes should be applicable to present-day conditions. The world's use of arithmetic changes, in keeping with the changes in science and business. Many of the traditional topics are no longer as important as formerly, such as compound numbers, greatest common divisor, least common multiple, complex and compound fractions, partial payments, true discount, partnership, apothecaries' weight, and cube root. Information about these subjects should be given, but formal drill on them is no longer regarded as necessary. For example, fractions with large denominators like $\frac{807}{1146}$

are not considered an important phase of this topic, since decimals have largely replaced them in everyday use.

3. The material should be organized scientifically; that is, it should be divided into steps, and these arranged in the order of their difficulty. For example, long division is not a single process, but it involves, as well, multiplication, carrying, subtraction, and the use of non-apparent quotients. A study by F. B. Knight, of the State University of Iowa, shows that there are 40,095 possible divisions using two-digit divisors. This indicates that a wide field must be covered in teaching long division, and that it is necessary to analyze the difficulties and present them systematically.

4. Tests should be devised which will reveal the difficulties of the individual student, and remedial exercises should be provided to overcome them. An important source of error among a large proportion of the students of arithmetic is the inability to read understandingly and to know just what is to be done. This, and similar handicaps, can be ascertained, and suitable remedies applied. Such tests are called "diagnostic tests," and many of this type have been prepared by specialists.

These few points show the trend of current thought and the care which is being exercised to find the true objectives of a course in arithmetic. It is thought by the foremost au-

thorities in this field that the outcome will be a better practical equipment of mathematical knowledge for the student and a greater enjoyment in the study of the subject. E.U.G.

History of Arithmetic

Arithmetic is the science of number, the scientific formulation of number relations. The savage formulates his number concepts in a crude way, using his fingers as counters, and when all are used, says "a hand," meaning 5, "two hands," meaning 10.

In Madagascar, a chief has been observed counting his army as follows: The soldiers pass before the chief and a pebble is dropped as a counter as each one passes. When ten pebbles have been dropped, one pebble is set aside and a new pile begun, and again when the pile has grown to ten, one is set aside and so on until ten have been set aside, when one is set aside to mean one hundred.

The Aztecs indicated 10 by a picture of the "upper half of man" and their word for 10 was *matlacili*, or *hand-half*. Some Indian tribes in the North express twenty thus: "A man come to an end." Another tribe calls it: "One Indian ended."

These few illustrations taken from thousands that travelers have brought to us from among the tribes indicate the attempt of the backward races to formulate number relations so that they may have some control over this important element of number in their lives. The same need that leads to this crude formulation on the part of the savage leads to a refinement of the subject among the more highly civilized races.

Far back in the centuries we find it taught in the schools of the East only for its utility, and therefore only those parts of it that were useful to the people were taught. Among the great

traders of Southwestern Asia, the Phoenicians, Babylonians, and others, arithmetic was taught extensively, as is seen by the tablets found by excavation in that part of the world. The tablets show comprehensive bank records, and some recently found show the work of school children. Among some of the Semitic people, arithmetic occupied from one-third to one-half of all the school time during the years corresponding to our later grade- and high-school years. In the commercial cities arithmetic was taught entirely for its utility. Italy as a commercial nation gave to the world mercantile arithmetic. During the time of the Hanseatic League (which see), the merchants throughout the commercial cities and along the routes of trade demanded that the arithmetic of trade and commerce be taught, and when the results obtained by the Church school did not satisfy them, they set up schools of their own for the study of arithmetic. Indeed, arithmetic was so completely dominated by commerce that it was no longer mentioned in the curricula of even the best schools.

Among the Romans and the Greeks, we find some plea for the study of arithmetic for its culture value. Plato, Aristotle, and Pythagoras all set value upon it as a cultural subject. Plato says, "It awakens the soul"; Pythagoras places it with gymnastics and music as one of the three great educational subjects. He names the subjects in the order—gymnastics, music, and mathematics. "By the first, the pupil was strengthened; by the second, purified; and by the third, perfected and made ready for the society of the gods." It must be recalled, however, that these Greek philosophers meant by *arithmetic* something very different from the *figuring* of commerce and industry. The latter they called *logistics*. Arithmetic to them meant what we now call the theory of numbers, a branch of higher mathematics. J.W.Y.

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A Course in Arithmetic. The following articles in these volumes, if studied in connection with the above, will serve as a basis for a fairly complete course in arithmetic:

Addition	Cancellation
Angle	Circle
Arabic Numerals	Cone
Area	Cube



FINGERS AS COUNTERS



THE AZTEC "TEN"



INDICATING "TWENTY"

OUTLINE OF DEPARTMENTS OF ARITHMETIC

I. Notation and Numeration

- (1) Arabic numbers
- (2) Roman numbers
- (3) Notation and numeration of money
- (4) Use of arithmetical signs

II. Basic Processes

- (1) Addition
- (2) Subtraction
- (3) Multiplication
- (4) Division

III. Common Fractions

- (1) Notation and numeration of fractions
- (2) Reduction
- (3) Addition of fractions
- (4) Subtraction of fractions
- (5) Multiplication of fractions
- (6) Division of fractions
- (7) Complex fractions

IV. Factors and Divisors

- (1) Tests of divisibility
- (2) Factoring
- (3) Cancellation
- (4) Greatest Common Divisor
- (5) Least Common Multiple

V. Decimal Fractions

- (1) Notation and numeration of decimals
- (2) Reduction
- (3) Addition of decimals
- (4) Subtraction of decimals
- (5) Multiplication of decimals
- (6) Division of decimals

VI. Denominate Numbers

- (1) Measure
 - (a) Of value
 - (b) Of weight
 - (c) Of length
 - (d) Of surface
 - (e) Of volume
 - (f) Of capacity
 - (g) Of time

- (2) Reduction
- (3) Addition
- (4) Subtraction
- (5) Multiplication
- (6) Division
- (7) Longitude and time

VII. Determination of Areas and Volumes

- (1) Angular measure
- (2) Area of surfaces
- (3) Volume of solids
- (4) Practical measurements
 - (a) Roofing and flooring
 - (b) Plastering and painting
 - (c) Masonry
 - (d) Lumber measure
 - (e) Tanks and bins

VIII. Percentage

- (1) Principles
- (2) Applications
 - (a) Profit and loss
 - (b) Commission
 - (c) Discount
 - (d) Taxes
 - (e) Insurance
 - (f) Interest
 1. Simple
 2. Compound
 - (g) Promissory notes
 - (h) Exchange
 1. Domestic
 2. Foreign
 - (i) Stocks and bonds

IX. Ratio and Proportion

- (1) Ratio
- (2) Simple proportion
- (3) Partnership

X. Powers and Roots

- (1) Involution
 - (a) The square of numbers
 - (b) The cube of numbers
- (2) Evolution
 - (a) Square root
 - (b) Cube root

Questions on Arithmetic

In what ways do you find the subject to have a cultural value?

Is it possible to study algebra if one does not have a fair working knowledge of arithmetic?

Why do most modern arithmetics omit such subjects as true discount, least common multiple, greatest common divisor, complex fractions, and the like?

Cube Root
Cubic Measure
Cylinder
Decimal Fraction
Degree
Denominate Numbers
Digit
Discount
Divisibility of Numbers
Division
Evolution

Factoring
Fractions
Graphs
Greatest Common Divisor
Insurance
Interest
Involution
Least Common Multiple
Longitude and Time
Mensuration
Metric System

Multiplication
Notation
Percentage
Polygon
Prism
Proportion
Pyramid
Quadrilateral
Ratio
Rectangle
Rhombus

Roman Numerals
Root
Sphere
Square
Square Measure
Square Root
Subtraction
Taxes
Triangle
Weights and Measures
Zero



ARIZONA, though its scenery was fashioned by those mighty Titans, water, fire, wind, and earthquake, is, nevertheless, a man-made state. Its name is derived from *Arizonac*, in the languages of both the Papago and Pima Indians, meaning *little spring*. It was called Arizona by the Spaniards as early as 1736, and must have been known to the Indians by their name of *Arizonac* for probably many years prior to that date.

Daniel Webster once described the region west of the Rocky Mountains as "a barren waste of prairie dogs, cactus, and shifting sands, incapable of producing anything, and therefore not worth retaining." The description was accurate enough at the time, but because of man's engineering skill, the cactus of the Arizona desert is giving way to cotton, alfalfa, oranges, dates, cantaloupes, and lettuce. Receiving through irrigation water that had been withheld by nature for centuries, the desert is gratefully repaying the men who made its sands profitable.

Mining, however, is still Arizona's most profitable industry. Paralleling the trail over which Coronado rode are now smooth highways through mining districts rich in copper—a treasure which Coronado passed, unsuspecting, on his quest for fabled gold.

Size and Location. On the greater part of its western line, Arizona is separated from California and Nevada by the Colorado River. To the south is Mexico, to the east is New Mexico, and to the north is Utah. Arizona, youngest state in the Union, is fifth in size, with a total area of 113,956 square miles, only 146 square miles of which are water. There are nearly 34,000 square miles in Indian reservations.

The People. In population, Arizona ranks forty-fifth. Only Delaware, Nevada, and Wyoming had fewer than its 334,162 inhabitants at the last national census. It averages but 2.9 people to the square mile. The New Eng-

land states, which have a combined area of little more than half that of Arizona, have a population more than twenty-two times as great. The population is made up of over 291,500 whites, 8,000 negroes, 1,700 Asiatics, and 33,000 Indians. Of over 78,000 foreign-born whites, about seventy-seven per cent are Mexican, the remainder being chiefly English, Canadian, German, Irish, and Italian.

Almost sixty-five per cent of the inhabitants live in the small towns or rural districts, and only thirty-five per cent in cities of over 2,500 people. The latter, however, are growing, some of them very rapidly. The most important cities are Phoenix, the capital, Tucson, Bisbee, Douglas, Globe, and Prescott.

Indians. The number of Indians in the state increases slowly, but steadily. All of them except a few hundred live in rural districts, chiefly on government reservations. The Navaho reservation, in the northeast corner of the state, has attracted more attention than most Indian colonies, because of the famous blankets which are manufactured by the Navahos. Close to the Navaho live the Moqui, or Hopi, Indians. They have aroused considerable interest because of the strictness with which they have preserved old customs followed before the coming of the white man. The Apache, Pima, Yuma, and Mohave tribes are also of importance. (See description of each Indian tribe, under INDIANS, AMERICAN.)

Education. Despite its scattered population, Arizona maintains a well-organized school system. Public-school lands of great extent furnish a permanent fund, but local taxation is necessary also. Free textbooks are supplied, and there is a teachers' pension fund for the common schools. Education is free, and compulsory from eight to sixteen years of age. There are high schools, teachers' colleges at Tempe and Flagstaff, and schools for the Indians at Phoenix and Tucson, in addition to those on the reservations. The illiteracy

percentage is 15.3, but it is the Indians and Mexicans who make it high.

University of Arizona, the only institution of its rank in the state, is a coeducational university at Tucson. It was founded by act of the territorial legislature of 1885, and was opened in 1891. It now includes the College of Agriculture, College of Law, College of Mines and Engineering, School of Music, School of Military Science, Arizona Bureau of Mines, the State Museum, the Agricultural Extension Service and Agricultural Experiment Station, besides the College of Education, College of Letters, Arts, and Sciences, and the Graduate College.

Besides the seventy-five acre campus, the university owns a 165-acre farm in the Santa Cruz Valley and four other experimental farms in different parts of the state, the one at Mesa being especially well known.

The Land and Rivers. Detached mountains extend across the state in a general northwest-southeast direction and divide it into two principal physical regions. There is a northwestern plateau and a southwestern lowland section. The plateau, which has an elevation of over 5,000 feet, is in no sense a table-land, but has a highly diversified surface of hills and canyons—deep chasms in the solid rock. To-day these rivers, with the exception of the Colorado, the most important river of the state, are mostly dry, or flow only during the brief rainy seasons, but below the surface of many of them is a regular flow of water which may be drawn out by pumping and used for irrigation.

The lower, southwestern section has a distinct slope from the mountain ranges, which divide it from the plateau, to the Gila River, a shallow stream flowing to the Colorado. With its tributaries, the Colorado drains the entire state into the Gulf of California. The lowland is not an actual plain, but is broken everywhere by short, isolated chains of mountains, which rise abruptly from the level surface. Here and there shallow tributaries of the Gila find their way among the buttes and mesas, but these are dry for a large part of the year. A notable exception is Salt River, which has a larger discharge than the Gila, and which waters the Salt River Valley.

The southern mountains are flat-topped, mainly of no great height, but in the north are lofty, outstanding peaks. Of these, a number are over 10,000 feet high, and one,

San Francisco Peak, an old volcanic mountain, is 12,611 feet.

Scenic Wonders. In the northwestern part of the state, there is to be seen the most marvelous river gorge in the world—the Grand Canyon of the Colorado, now within a national park. It is described elsewhere in these volumes. This formation, wrought by the busy river through the ages, is no more remarkable for its steep cliffs and the tumbling river in its narrow bed than for the wealth of brilliant coloring which glows in its rocks.

Had Arizona nothing to offer to the visitor but this one sight, it would well repay a journey across the continent. But there are other wonders no less noteworthy in their way. In the northeastern part of the state stretches the Painted Desert, "the most alluring desert in the world," as one distinguished traveler has called it. Pink, blue, yellow, white, brown, and red are its sands, its clays and its rocky ledges, and all the colors have an especial brightness in the clear air and bright sunshine.

To the northeast, in Navaho County, near Holbrook, is one of the strangest forests in the world—a forest of stone, the famous Petrified Forest. The trees, some of which are 200 feet long and from four to five feet in diameter, are not standing, but lie on the ground, for the most part at the foot of the mesas in which they were earlier embedded. Every

little particle of the wood has been replaced by a particle of silica, and the veins and markings all show perfectly. But the coloring in these agate, jasper, and chalcedony logs is far more varied than that of the living wood, and enterprising visitors were not long in finding that the stone when polished could be used for many purposes. Great sections were removed, and it became evident that this wonderful formation would in time be entirely destroyed. The United States government therefore made of it a forest reserve of a new type—a fossil forest reserve.

There are many other interesting features in the state, among them "Montezuma's

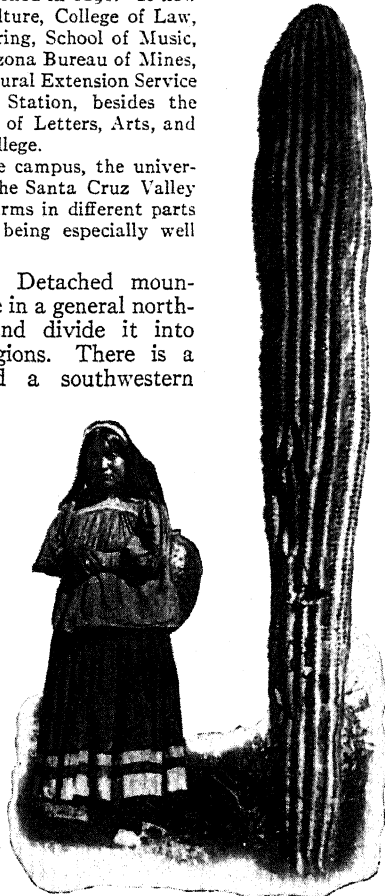
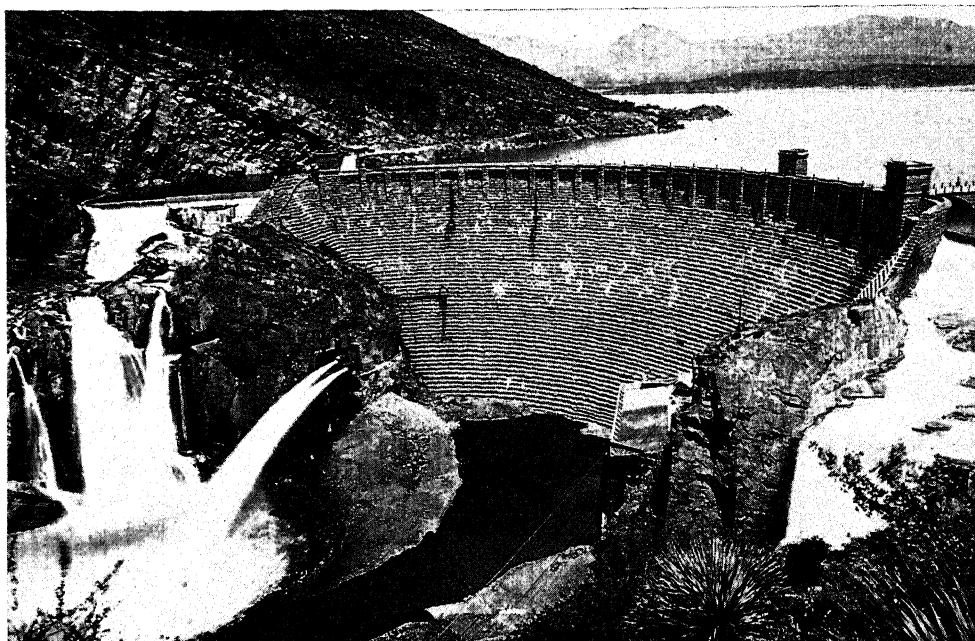


Photo: Keystone

GIANT CACTUS

An Apache squaw standing by the side of a specimen of the giant cactus for which the state is famous.



THE GREAT ROOSEVELT DAM

The base of the dam covers an acre of ground, and the height is 284 feet. At the top, from bank to bank, it is 1080 feet long and forms a fine driveway.

Well," and the cliff dwellings within this strange cavity. Halfway between the Well and Camp Verde is the finest cliff-house in Central Arizona, called "Montezuma's Castle," although there is no historical reason for naming it after the Aztec ruler. Throughout the state there are many rocks bearing picture inscriptions carved by the Indians long ages ago, which, could we read them, might reveal to an interested world more of the early history of Arizona.

Climate and Vegetation. No part of the United States has more sunshine than has Arizona, 292 days out of each year, on an average, being clear. A hotel in Yuma has advertised "free meals every day the sun does not shine." To a traveler from the Eastern states who reaches Arizona on a sunshiny day, it seems that he has never seen nor felt sunshine before, so intense is the glow. The northern plateau section has an average temperature of about 48°, which is approximately that of New York, but extremes of heat and cold are not present. Particularly delightful is this high region during the summer. On the southern lowland the average annual temperature is about 64°, but with a summer extreme of 115°. Yuma, at the junction of the Gila and Colorado rivers, is one of the hottest cities in the world. The dryness of the air, however, makes the great heat endurable.

Arizona is very dry in almost every section; only in a few mountain districts is there a fair rainfall. The northern plateaus have about twenty inches of rain a year, but in the southern portion five inches is a common average. This dryness of the air makes Arizona one of the most healthful regions of the United States, and it has become a favorite health resort, especially for people with lung disease.

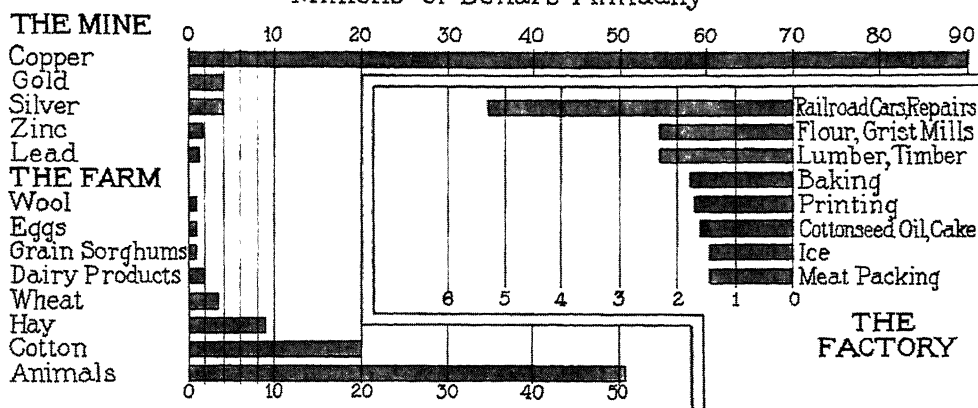
Everywhere vegetation shows the great need of water. In the mountains, to be sure, there are forests of oak, cedar, pine, fir, and spruce, and the Coconino forest, 6,000 square miles in extent, is one of the very largest unbroken pine forests in the United States. There are nine national forests, occupying 12,327,764 acres.

In many places, however, desert conditions prevail, and little grows except sagebrush, bunch grass, various species of cactus, the mesquite, and the ever-present yucca. After the summer rains, grass springs up over much of the mesa land, and furnishes pasture for stock, while the "deserts" are green and flowering in springtime.

Agriculture. The lack of moisture has kept Arizona thus far from becoming prominent as an agricultural state, for without irrigation practically nothing will grow, and water has been very hard to obtain. Not many years ago, only 1.7 per cent of the land was under cultivation, and of this, 350,000 acres, over

ARIZONA PRODUCTS CHART

Millions of Dollars Annually



MINE, FARM, AND FACTORY PRODUCTS: AVERAGED FOR THREE YEARS

ninety per cent was irrigated. The small irrigation schemes, of which there are over 1,000 in various parts of the state, proved that the valley lands were fertile and could be made very productive, and the Federal government determined upon a gigantic scheme—the so-called Salt River Project, or Roosevelt Dam and Irrigation Project (see IRRIGATION). The great reservoir, which was completed in 1911 and dedicated in March of that year by Theodore Roosevelt, is large enough to contain over 1,400,000 acre-feet of water, or water enough to cover that number of acres one foot deep. Today the Salt River district has an aggregate crop yield of over 20,000,000 bushels, mainly due to the big irrigation projects and subsidiary dams that now permit cultivation of about 400,000 acres. Arizona joined with six other Southwestern states in what is known as the Colorado River Project, by which flood control, reclamation, and hydroelectric development are planned. This project, in prospect for twenty-five years, was approved by Congress 1928.

At Yuma, another great irrigation scheme has been put into effect. Over 100,000 acres of the rich river valley soil are rendered capable of cultivation by the waters diverted by a long weir dam at Laguna. A part of this reclaimed land is on the California side, on the Yuma reservation, but the larger part is in Yuma County, Arizona.

An important crop of the state is hay, including forage plants of all sorts, and of these the most valuable is alfalfa. Three or more crops of this are cut each year, and the total yield in some years exceeds 600,000 tons. In no section of the country is the production of hay per acre higher than in Arizona.

Cotton is the most valuable crop now. In 1910 eleven bales were produced; in less than fifteen years the production was 119,000 bales, on over 157,000 acres. Orchard crops, including apples, pears, peaches, grapes, apricots, lemons, oranges, grapefruit, and figs, do well. Cantaloupes and lettuce are very important vegetable crops. Strawberries are grown in some sections. Near Phoenix and at Yuma, dates have been planted, and it is believed that this useful fruit can be grown in areas which had been considered too alkaline for agriculture of any sort.

Bees are a source of profit, and carloads of honey are shipped east every year.

Stock-Raising. This is an important phase of agriculture in Arizona, for much of the land which is too dry for the production of crops has a fine growth of grasses, some of which seem to be remarkably independent of moisture conditions. Thus, some of the most typical of the great Western cattle ranches are in Arizona, chiefly in the northern plateau region and in the southeast. Most of the cattle are grown for market, and not for dairy purposes. Sheep-raising is important, there being over a million sheep on the ranges. Arizona now produces over 6,000,000 pounds of wool every year. With the growth of irrigation projects, the cattle industry may decline as agriculture increases, but the change will be slow.

Minerals. The great wealth of Arizona lies in its minerals, few if any of the states surpassing it in the richness of its deposits. Some of the mines have been worked since the early Spanish occupation of Mexico, or over 300 years, but until the last few years mining has not been highly developed, because of the lack of transportation facilities. To-day Arizona stands first in the production of copper,

producing almost half of that metal mined in the United States, or a quarter of the world's supply. Gold, silver, lead, and zinc are mined, and one of the few commercial deposits of asbestos is found in Arizona. Mineral production is the state's greatest source of income. There are many billion tons of coal in the state, but much of it is on Indian reservations, where Federal regulations prevent commercial exploitation.

Manufactures. For the most part, the manufacturing operations are connected very closely with mining, copper-smelting and refining being the most important. The number of manufacturing establishments is about 300; the value of products, \$125,000,000. With unlimited water power, natural resources of coal and lumber, raw materials, and mild climate, Arizona is a promising field for industrial development.

The state has certain manufactures which are characteristic and of great interest to visitors. These are the baskets, pottery, rugs, and blankets made by the various Indian tribes. When a train on one of the great transcontinental railways arrives at a station, there is to be seen a row of Indian women, each with her heap of handiwork.

Transportation. Two transcontinental railways, the Atchison, Topeka & Santa Fe and the Southern Pacific, cross the state, the former in the northern part, the latter in the southern. There are more than 2,500 miles of railroad in the state. A branch line of the Santa Fe system connects the two main lines, passing through Phoenix and Prescott, two of the chief cities, and various branch lines lead to other important towns and to the Grand Canyon of the Colorado.

Government. Arizona is governed under the constitution of 1911, which provides for a governor, secretary of state, state auditor, state treasurer, attorney-general, and superintendent of public instruction. Each of these holds office for two years, and all except the state treasurer may be reelected. The legislative body consists of two houses, a senate of nineteen members and a house of representatives of forty-six members. The most interesting legislative feature is the existence of laws providing for initiative and referendum (which see).

The judicial power is vested in justices of the peace, superior courts, and a supreme court. For purposes of local government, the state is divided into counties, but the most important government units are the cities. Any one of these may frame a charter as soon as it has 3,500 inhabitants, but every city as well as every county is restricted by certain state laws as to franchise and indebtedness.

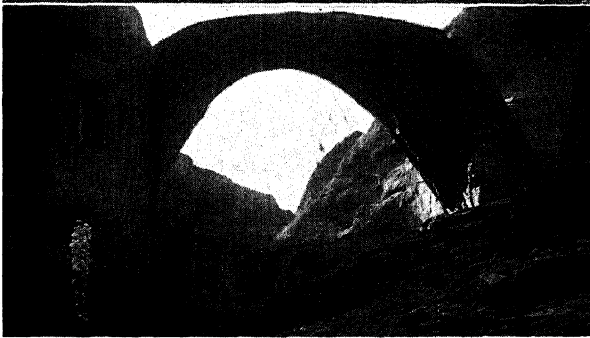
By the constitution, any male citizen of the United States, twenty-one years of age or

over, is privileged to vote; in 1912 full suffrage was granted to women. In that same year the question of the recall of officers, much debated at the time the state entered the Union (see subhead *History*, below), was settled by the passing of a law which made every elective officer, including judges, subject to recall (see *RECALL*). A valid petition against any officer must contain the names of twenty-five per cent of those who voted at the last preceding election. In 1914 an amendment to the constitution was voted which provided for state-wide prohibition of the liquor traffic, in advance of national action.

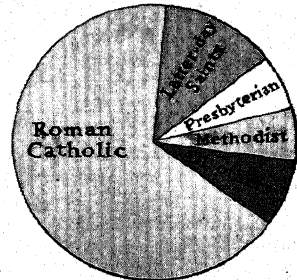
History. That the valleys of the Gila, Colorado, the little Colorado, and the Salt rivers were once the home of Indian races well advanced in culture may be seen from the ruins of pueblos which still exist. The fame of these had penetrated to Mexico City, far to the south, and the Spanish conquerors there heard of the famous "Seven Cities of Cibola," and their hoards of gold (see *CIBOLA, SEVEN CITIES OF*). The first white man to enter the territory was Marcos de Niza, a Franciscan friar, who passed through the San Pedro Valley in 1539, on his way to find the Seven Cities (the Zuni villages). In the next year Coronado, led by the desire for treasure, visited the Hopi and Zuni villages now in Arizona and New Mexico. Later, the Roman Catholic Church sent priests into the southern part of Arizona to establish missions. Of these, the best known was Father Kino. He journeyed thousands of miles on exploring trips, proved that California was not an island, as had been believed by the Spanish, and drew a map of Lower California and Pimeria which was used unchanged for a hundred years. He founded, in 1700, the mission of San Xavier del Bac (near Tucson) which is still maintained in a newer church. Many grain and stock farms were started by Father Kino for the support of his missions and of the peaceful Pima Indians whom he gathered about him.

Uprisings of Apache Indians checked the settlement and growth of the territory. In 1736 nuggets of free silver were found at Arizonac, in Sonora, just across the present Mexican line, but in five years the mines were exhausted. Spanish settlement at Tucson, the oldest large town in the state, was made in 1776, upon the site of a former Indian *rancheria*. In that year, the garrison of Tubac was removed to Tucson, whence went the De Anza expedition that founded San Francisco.

Formation of a Territory. Spanish and Mexican settlements were mainly in Southern Arizona valleys, with expansion northward blocked by desert conditions and by the wild Apaches of the hills. In 1751, there was a revolt of the Pima-Papago Indians of Northern



RELIGIONS



In Arizona. The three illustrations present the capitol building; the Nonnezoshi bridge of stone, one of the scenic wonders of the state; and a date farm in the Salt River Valley, showing ripened fruit.

Sonora and a part of the present Arizona, with slaying of many Spaniards, who were charged with having worked the tribesmen too hard in the mines. But peace was restored three years later. The Pimas helped in the continuing warfare against the Apaches, but Tucson had to be walled for protection.

After the Mexican War, the United States took possession of the land as far south as the Gila River, and in the late forties many thousand Americans took the Gila route to the California gold fields. In 1854, by the Gadsden Purchase, the United States took over the region south to the present national boundary line. At the outbreak of the Civil War, Federal garrisons were withdrawn, and only Tucson remained as an outpost of civilization. As early as 1856, petitions were sent to Congress for separate territorial organization of the southern half of what was then New Mexico, but these were ignored because the population of the proposed subdivision was strongly pro-slavery. In 1863, the Southern Confederacy established a Territory of Arizona, reaching from Texas to California, south of the 34th parallel of latitude. In the same year the Federal Congress set Arizona aside as a territory, but halved New Mexico by a north-and-south line. The capital first was at Prescott and later at Tucson, but since 1889 has been at Phoenix.

Boundary disputes with every neighboring state, Indian risings, and the extreme dryness of the soil made development slow for a time, but after 1886 the Indians were quieted by the removal of the Chiricahua Apaches to Florida, while irrigation schemes made possible the cultivation of more land.

Admission as a State. As early as 1891 the territory, though sparsely settled, began to agitate for admission to the Union as a state, but its petitions were denied. In 1905 and 1906, Congress passed bills favoring the admission of Arizona and New Mexico as one state, but the vote of the former defeated the plan. Finally, in 1910, an enabling act for the admission of the two separate territories was passed, and an Arizona convention prepared a constitution. This radical document included provision for the recall of judges, and because of this clause, President Taft refused to assent to the admission of the state. Congress, which had passed a resolution authorizing the admission, then passed a new one, making admission constitutional on the elimination of the recall clause. Later, in 1911, the people voted to make the change, and the proclamation of Arizona's statehood was signed in 1912. In that same year, an amendment to the constitution legalized the recall of all elective officers, and provided for woman suffrage. Thus, although the newest of American states, in its provisions for the

recall and by adopting full suffrage for women and abolishing the liquor traffic before the prohibition amendment, Arizona stands in the front rank of progressive commonwealths.

Other Items of Interest. Arizona shares with New Mexico the distinction of being the youngest state, but was a territory before either Oklahoma, Wyoming, Idaho, or Montana.

Though the great Roosevelt Dam is primarily for irrigation, it supplies the power which generates electric light for the city of Phoenix and current to drive the machinery of several large mining camps.

Several of the counties of Arizona have well-known Indian names: Apache, Gila, Maricopa, Mohave, Navaho, Pima, Yavapai, and Yuma are names of tribes, and Cochise was a famous Apache chief. Only two, Graham and Greenlee, have English names.

Near Flagstaff is the observatory erected for Percival Lowell, known for his discoveries relating to the planet Mars.

On the southern plains, especially in the valleys of the Salt and Gila rivers, are the remains of scores of ancient towns, with inclusion of the ruins of the great communal castles. Only one is standing—Casa Grande (large house), near Florence, which is maintained as a national monument. Canals, comparable in size and length to those of today, conveyed river waters to many thousands of irrigated acres. These people all had departed before the Spaniards came, with descendants probably left among the modern Hopi, Zuni, and Pueblo tribes. Other ancient peoples lived in fortress caverns, high up on the mountain sides or in canyon fastnesses; their homes were found in every part of the mountain sections. Especially notable are the cliff dwellings near Roosevelt, in the Canyon de Chelly, and in the Verde Valley; in the last section also are found cave dwellings, probably excavated by an even more primitive race.

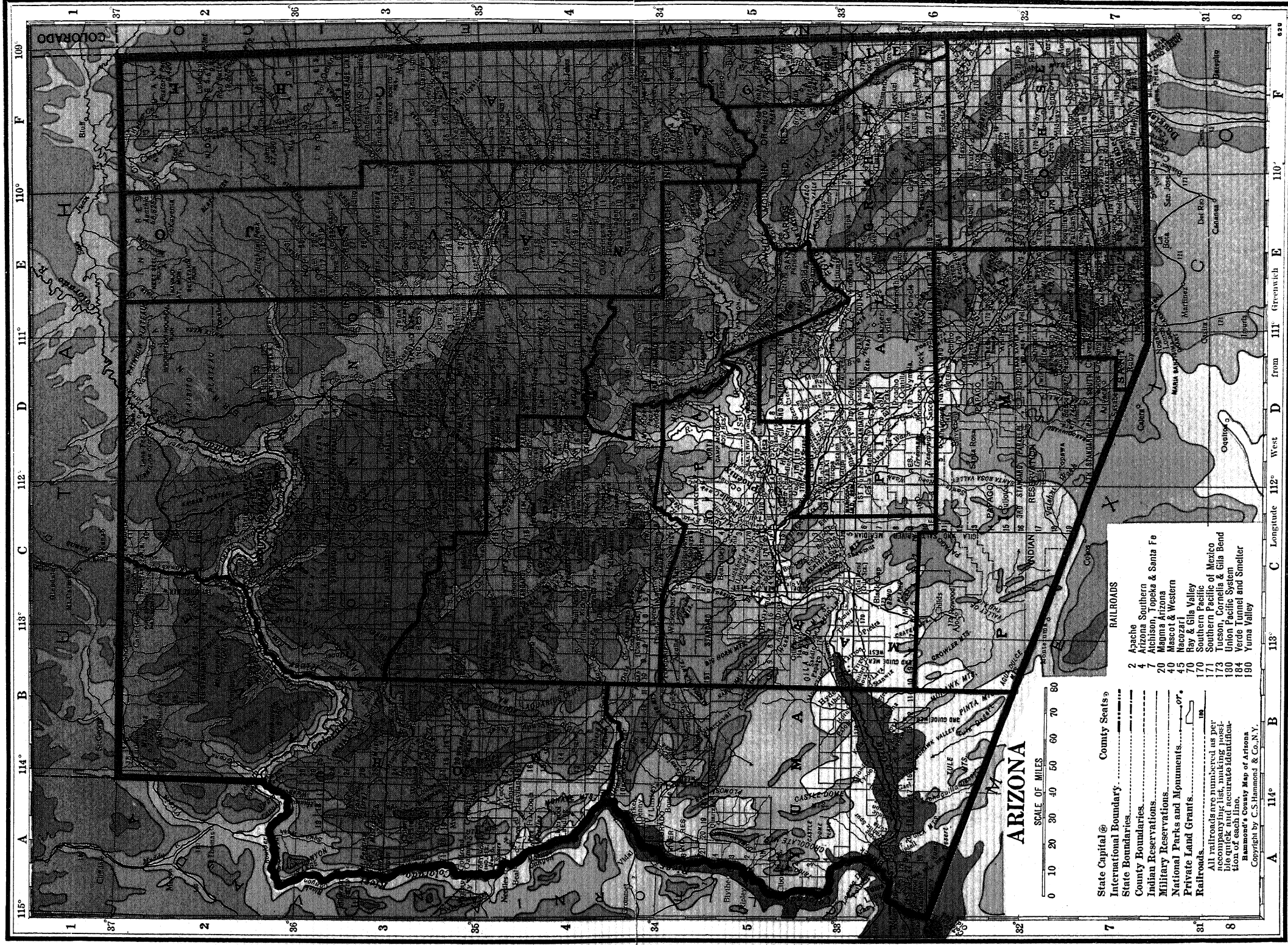
The oldest railroad, built in 1878, is the Coronado, serving the Clifton mining district. Its first locomotive was hauled by ox-team 600 miles, over desert and mountain, from Colorado. About the same time, the Southern Pacific crossed the Colorado River at Yuma.

Camels, brought from Africa under Congressional appropriation, were used in 1856 in a survey, made by Edward F. Beale, of a railroad route along the 35th parallel of latitude. Though declared valuable for such work, they were found of little value elsewhere. Liberated in California, Nevada, and Arizona, the camels eventually were killed off or died from natural causes.

Arizona has several nicknames, being called the "Sunset" state, the "Copper" state, or the "Apache" state. Its flower is the Saguaro cactus. c.o.c.

ARIZONA

Agua Caliente, (B5)	100	Liberty, (C5)	150
Ajo, (C6)	900	Lowell, (F7)	2,500
Alhambra, (C5)	100	Mammoth, (E6)	400
Arivaca, (D7)	150	Maricopa, (D5)	100
Arlington, (C5)	100	Matthews, (F6)	200
Ashfork, (C3)	200	Mayer, (C4)	200
Bellevue, (E5)	100	Mesa, (D5)	3,036
Benson, (E7)	900	Metcalf, (F5)	2,500
Bisbee, (F7)	9,205	Miami, (E5)	6,689
Blackwater, (D5)	250	Mohave City, (A3)	180
Bonita, (F6)	100	Morenci, (F5)	5,010
Bowie, (F6)	350	Naco, (F7)	200
Brownell, (C6)	200	Nogales, (E7)	5,199
Buckeye, (C5)	400	Oatman, (A3)	900
Campverde, (D4)	300	Octave, (C4)	500
Canille, (E7)	200	Paradise, (F7)	100
Casa Blanca, (D5)	1,200	Parker, (A4)	400
Casagrande, (D6)	948	Patagonia, (E7)	500
Cavecreek, (D5)	100	Payson, (D4)	170
Central, (F6)	300	Pearce, (F7)	700
Chiricahua, (F7)	200	PHOENIX, (C5)	38,669
Chloride, (A3)	800	Pima, (F6)	515
Christmas, (E5)	200	Pine, (D4)	100
Clarkdale, (D4)	900	Pinedale, (E4)	100
Clifton, (F5)	4,163	Pirtleville, (F7)	1,508
Cochise, (F6)	100	Prescott, (C4)	5,010
Cochran, (D5)	100	Quartzsite, (A5)	300
Concho, (F4)	260	Ray, (E5)	900
Congress, (B4)	900	Rice, (E5)	300
Constellation, (C4)	100	Roosevelt, (D5)	200
Cottonwood, (C4)	900	Sacaton, (D5)	250
Courtland, (F7)	500	Safford, (F6)	1,336
Crittenden, (E7)	170	Saint David, (E7)	500
Crown King, (C4)	200	Saint Johns, (F4)	1,250
Dome, (A6)	100	San Carlos, (E5)	2,500
Don Luis, (E7)	250	San Simon, (F6)	280
Douglas, (F7)	9,916	Sasco, (D6)	300
Dudleyville, (E6)	150	Seligman, (C3)	330
Durcan, (F6)	600	Show Low, (F4)	150
Duquesne, (E7)	150	Silverbell, (D6)	700
Eden, (F6)	500	Silverking, (D5)	100
Escuela, (E6)	200	Snowflake, (E4)	758
Fairbank, (E7)	180	Solomonsville, (F6)	750
Flagstaff, (D3)	3,186	Somerton, (A6)	938
Florence, (D5)	1,161	Sonora, (E5)	800
Fort Apache, (F5)	300	Springerville, (F4)	600
Fort Huachuca, (E7)	400	Supai, (C3)	100
Fort Thomas, (E5)	150	Superior, (D5)	900
Franklin, (F6)	100	Taylor, (E4)	100
Geronimo, (F5)	100	Tempe, (C5)	1,963
Gila Bend, (C6)	200	Thatcher, (F6)	899
Gilbert, (D5)	865	Tolleson, (C5)	200
Gleeson, (F7)	500	Tombstone, (F7)	1,178
Glenbar, (F6)	200	Toreva, (E3)	550
Glendale, (C5)	2,737	Tubac, (D7)	300
Globe, (E5)	7,044	Tucson, (E6)	26,733
Grand Canyon, (C2)	130	Twin Buttes, (D7)	300
Greer, (F4)	100	Venezia, (C4)	200
Hackberry, (B3)	100	Walker, (C4)	150
Harshaw, (E7)	100	Warren, (F7)	300
Hayden, (E5)	900	Welton, (B6)	200
Helvetia, (E7)	100	Wendon, (B5)	160
Holbrook, (E4)	1,206	Wickenburg, (C5)	527
Humboldt, (C4)	100	Wilcox, (F6)	905
Jerome, (C4)	4,030	Williams, (C3)	1,350
Kelvin, (E5)	350	Winkelman, (E5)	573
Kingman, (A3)	1,000	Winslow, (E3)	3,730
Lehi, (D5)	300	Yuma, (A6)	4,237



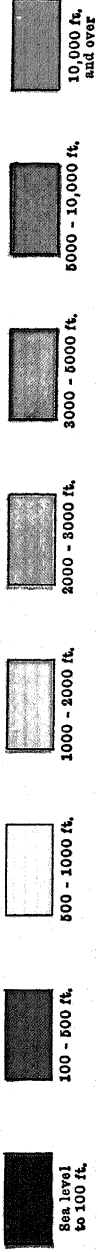
ARIZONA

SCALE OF MILES
0 10 20 30 40 50 60 70 80

- State Capital @
 - International Boundary
 - County Seats
 - County Boundaries
 - Indian Reservations
 - Military Reservations
 - National Parks and Monuments
 - Private Land Grants
 - Railroads
- All railroads numbered as per accompanying list, making possible quick and accurate identification of each line.
- Hammond's County Map of Arizona
Copyright by C.S. Hammond & Co., N.Y.

RAILROADS

- 2 Apache
- 4 Arizona Southern
- 7 Atchison, Topeka & Santa Fe
- 20 Magma Arizona
- 40 Mascot & Western
- 45 Naco
- 70 Ray & Gila Valley
- 170 Southern Pacific
- 171 Southern Pacific of Mexico
- 173 Tucson, Cornelia & Gila Bend
- 180 Union Pacific System
- 184 Verde Tunnel and Smelter
- 190 Yuma Valley



Engraved and printed expressly for THE WORLD BOOK

How to Read a Map; See page xvi, facing text page 1.

QUESTIONS ON ARIZONA

(An Outline suitable for Arizona will be found with the article "State.")

- What was the Gadsden Purchase, and why was it so named?
Why did President Taft delay the admission of Arizona to statehood?
For what use were camels brought into the territory?
Review the story of the Boulder Dam project.
In what way did the Southern Confederacy touch the history of Arizona?
How did the first locomotive reach the territory?
Is the "desert" area in Arizona ever clothed in green?
What are Arizona's great natural wonders?
What is the state's chief source of income?
Why was it so long in obtaining statehood?
In what strange kind of dwellings did some of the ancestors of Arizona Indians live?
How does the population compare with that of New England?
What early Spanish mission is still in use?
Which city in the state is the oldest?
What two benefits are derived from the Roosevelt Dam?
How does the Painted Desert get its name?
Why is illiteracy high?
How do the names of the counties tell something of the history of this region?
Is there much cloudy weather?
Why did the Spaniards come to Arizona?
Compare the date of their arrival with that of the settlement of Virginia by the English.
Make a comparison which indicates Arizona's importance as a copper state.
Under what conditions do its Indians live to-day? What well-known articles do they make?
When did Arizona become a state?
How does Arizona compare in size with the other states of the Union? In density of population?
What are the principal cities? In which one are the laws made?
In what three respects has the state shown itself a progressive lawmaker?
What well-known dance takes place in Arizona?
Has the state any forests?
What famous astronomical observatory is located in Arizona?
Were there ever any volcanoes in this region?
After the Mexican War, why was Congress slow in organizing this territory?
Are there many Indians in Arizona?
What is the story of the state's law providing for the recall of judges?
What is the petrified forest?
Is there any coal in the state? Why is it not mined?
Besides copper, what are the chief metals?
What sort of vegetation grows in the desert?
What tropical fruit is being grown, often in soil too alkaline for other crops?
Is there much manufacturing in Arizona?
What crop has recently taken first place in the state?
Can fruits be raised successfully?
How long has Arizona belonged to the United States? Was it all acquired at the same time?
How did the state get its name?
What has irrigation done for it?
Is there anything unusual about the number of Arizona's Representatives in Congress?

Related Subjects. The following articles will help the reader to gain a more detailed knowledge of the state of Arizona:

CITIES AND TOWNS

For description of Arizona's towns, see back of state map.

INDIAN TRIBES

The following are described under INDIANS, AMERICAN

Apache	Moqui
Mohave	Navaho

MOUNTAINS

Rocky

RIVERS

Colorado Gila

LEADING PRODUCTS

Alfalfa	Copper
Cattle	Cotton

UNCLASSIFIED

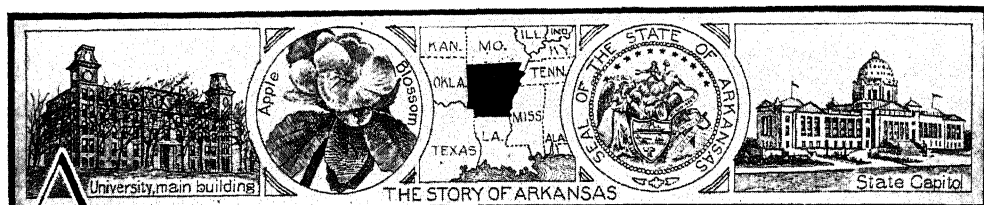
Cibola, Seven Cities of	Grand Canyon
Cliff Dwellers	Irrigation
Coronado	Mesa
Gadsden Purchase	Parks, National

ARK. In the Bible, three objects are referred to by this term, all of which were vessels for the safe-keeping of some precious object:

(1) The floating vessel built by Noah, in which he and his family and two individuals, male and female, of each living species of animal life were safely sheltered during the Deluge (*Gen. vi*). Measured by the common standards of to-day, the ark was 450 feet long, seventy-five feet wide, and forty-five feet high.

(2) The cradle of bulrushes in which Moses was placed by his mother (*Exod. ii*).

(3) Ark of the Covenant. This was the sacred chest which the Lord directed Moses to make to contain the Tables of the Law which he had received on Mount Sinai. It was four and one-half feet long, two and one-fourth feet wide, and two and one-fourth feet high. It was covered within and without with gold, and was carried by staves inserted in rings on the corners. This Ark of the Covenant was the most sacred possession of the Israelites. It was placed in the Holy of Holies in the Tabernacle and later in a similar position in Solomon's Temple (see *Exodus XXV, 10-22; XXVII, 1-9*).



ARKANSAS, ar' kan saw, one of the West South-Central states of the American Union, was formerly known as the BEAR STATE. It was largely wilderness even as late as the War of Secession, and its frontier reputation clung to it for years after Arkansas had become a state of orderly law and civilization. Many people judged it from humorous literature, and pictured it as a state where everyone carried bowie knives, and fought duels, and killed bears for occupation. De Soto, gazing across the turbid waters of the Mississippi, saw but the shores and forests of a wilderness. Had he gazed into the crystal of the future he would have seen an empire ready to blossom. To-day the industries, the crops, and the varied minerals of this region form a triple crown of wealth for Arkansas, and justify its new name of WONDER STATE.

Size and Location. The irregular line of the Mississippi River separates Arkansas, on the east, from Tennessee and Mississippi. On the north lies Missouri, and on the south, Louisiana. Oklahoma borders it on the west, while Texas cuts the southwest corner out of the state's almost square area. In spirit as well as in climate and location, Arkansas is a Southern state. In size, it ranks twenty-sixth among the states, its area of 53,335 square miles making it slightly smaller than the state of Illinois.

People and Cities. In population, Arkansas ranks twenty-fifth, but its 1,800,000 people are almost equal to the total population of the states of Wyoming, Idaho, Arizona, New Mexico, and Utah. There are over thirty-three people to every square mile, and over eighty-three per cent of the population is rural, or lives in cities of fewer than 2,500 people. Only twenty-seven per cent are negroes, and eight-tenths of one per cent are foreign-born. Only seven cities have over 10,000 population—Little Rock (the capital), Fort Smith, Pine Bluff, North Little Rock, and Hot Springs National Park, and the two oil towns, El Dorado and Smackover, which grew very rapidly after the discovery of oil.

Educational Institutions. Like all states which have a proportionately large rural population, Arkansas has found its educational problem a difficult one. At its admission to the Union in 1836, liberal provision was made for education, but no school system was organized until after the War of Secession. Recently, decided advance has been made. Since 1909 a compulsory school attendance law has been in force. In 1925 the state normal and four agricultural high schools were given the rank of colleges by the legislature. In 1926 an amendment was passed approving an increased rate of tax for edu-

cational purposes. The illiteracy percentage for the state is 9.4.

In addition to the regular system of graded and high schools, there are many institutions of higher learning, among which are the following:

The University of Arkansas, at the head of the educational system, was established in 1871. With the exception of the medical school (at Little Rock), all the departments for white students are at Fayetteville. Other state-controlled schools for whites are the following:

- State Teachers' College, Conway.
- Agricultural and Mechanical College, Dist. 1, Jonesboro.
- Agricultural and Mechanical College, Dist. 2, Russellville.
- Agricultural and Mechanical College, Dist. 3, Magnolia.
- Agricultural and Mechanical College, Dist. 4, Monticello.

Arkansas Law School, Little Rock.

For colored students, there are the Agricultural, Mechanical and Normal School at Pine Bluff, Philander-Smith College (Methodist) at Little Rock, Arkansas Baptist College at Little Rock, Shorter College (African Methodist) at North Little Rock.

There are also two private schools—John E. Brown College at Siloam Springs, and John Brown University at Sulphur Springs—of high grade.

State Institutions. Little Rock has most of the charitable and penal institutions; the Arkansas School for the Deaf, the Arkansas School for the Blind, the Hospital for Nervous Diseases, the Confederate Home, and the state penitentiary are all in or near that city. There is a state farm for women near Little Rock, an Industrial School for Boys near Pine Bluff, and an Industrial School for Girls near Alexander. There is a state tuberculosis sanatorium near Booneville. The schools for the deaf and blind are not classed as charitable institutions, but are under a separate board, with the state superintendent as chairman.

The Land. A relief map of Arkansas shows that from its western half, which is hilly and mountainous, the state slopes gently to the level plains of the eastern half. The elevations range from 2,800 feet at Mount Magazine, in the west-central part of the state, to about 200 feet above sea level in the southeast corner. There are two mountain ranges, both belonging to the Ozark uplift. The Boston Mountains lie north of the Arkansas River, with a general elevation of from 1,500 to 1,800 feet. The Ouachita Mountains lie south of the Arkansas River, and their average elevation is from 700 to 1,000 feet, with occasional peaks reaching the height of more than 2,500 feet. The Ozarks of Arkansas are widely known as a scenic playground. Arkansas has many mineral spring resorts which attract visitors from far and near. Diamond Cave, almost the equal in size of the Mammoth Cave, Kentucky, and Mammoth Spring, believed to be the

largest in the world, are two of the scenic wonders of the state. Originally, the entire state was covered with timber, except an area of about 1,000,000 acres in extent, consisting of prairies, lying in the eastern part, north of the Arkansas River. There are wide alluvial bottoms adjacent to the Mississippi River and its several tributaries. The delta lands along the lower Arkansas, lower White, and in the Saint Francis Valley are widely known for their great fertility and abundant production of crops. In the northwestern highlands, the surface soils are of limestone origin, and are very productive of clover, wheat, and fruits of various kinds. The soils of the southern section are more or less sandy, with a clay sub-soil, and it is here that conditions seem to be naturally favorable for the cultivation of cotton, sweet potatoes, watermelons, sugar cane, and other crops characteristically Southern.

Rivers and Lakes. The water surface is estimated at 810 square miles; and the state has about 3,000 miles of navigable rivers within or upon its borders. The rivers run to the Mississippi; in the eastern part are numerous "ox-bow" lakes, formed by changing channels of the larger streams.

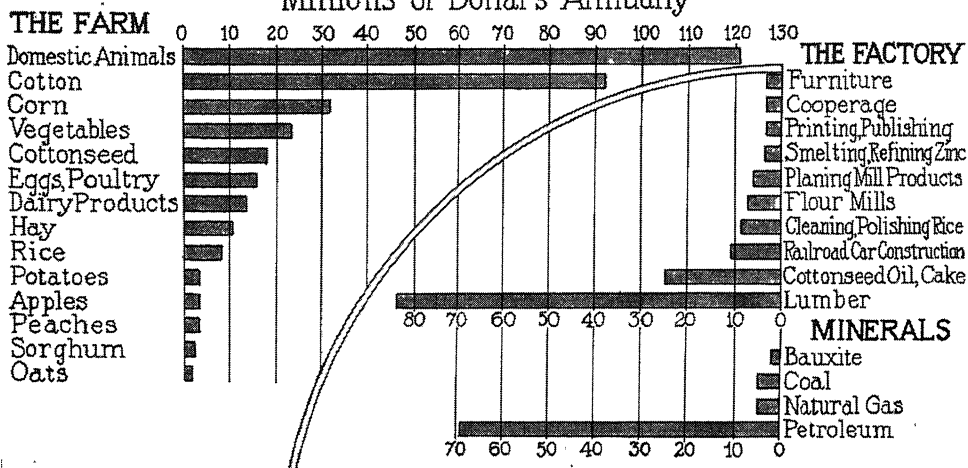
White River and its several tributaries, traversing the most rugged portions of the Ozark region, afford some wonderful scenic effects. The cedar-crested cliffs along these streams tower many thousands of feet above the rapid-flowing crystal waters below. The Arkansas, which traverses the state from east to west, is the same river that dredged the Royal Gorge through the heart of the Rockies, and in its course through the mountain regions of Arkansas it presents many attractive landscape effects.

Other rivers of importance are the Black, Cache, and Saint Francis, in the northwest, and the Saline, the Ouachita (the Washita), and the Red rivers, in the southwest, more valuable for their use in the natural drainage of the country than as landscape features.

Mineral Springs. Many springs of excellent water are characteristic of the state; in the limestone region they are especially abundant. Some have mineral properties, but more are noted for their unusual purity and freedom from mineral matter. Crescent Springs at Eureka Springs and Elixir Spring in Boone County contain less than six grains of mineral matter to the gallon. The famous waters of the Hot Springs of Arkansas are among the purest waters in the state, and their health-giving qualities are derived from radium emanation rather than from minerals in solution. Some of the mineral waters contain Epsom salt, and must be used with discretion. Thousands of people annually visit the watering places of the hill country—Eureka Springs, Sulphur Springs, Mammoth Springs, and Hot Springs. The most famous of these resorts is the Hot Springs National Park, often called

ARKANSAS PRODUCTS CHART

Millions of Dollars Annually



THE FARM, THE FACTORY, AND THE MINE: FOUR YEARS' PRODUCTION AVERAGED

the "Baden-Baden of America." Here the water comes from the side of the mountain at a temperature of 135° F. Mammoth Springs is said to flow 9,000 barrels a minute. This spring may be the resurgence of two Missouri streams which mysteriously disappear underground not far from Mammoth Springs.

The theory as to the origin of the hot waters is that the rainfall poured into a great basin between the mountains at Hot Springs penetrates the porous earth to such a great depth that it comes in contact with the rocks still hot from ancient subterranean fires, and that this water forms steam which is forced back through the crevices of the other rocks to a point near the surface, where it is condensed again into water before it emerges from the earth. This would explain both the heat and the purity of the water. The Indians discovered these springs and appreciated their curative value. De Soto was the first white man to visit the Hot Springs, which, legend says, may have been the fabled Fountain of Youth which Ponce de Leon and the Spanish explorers sought.

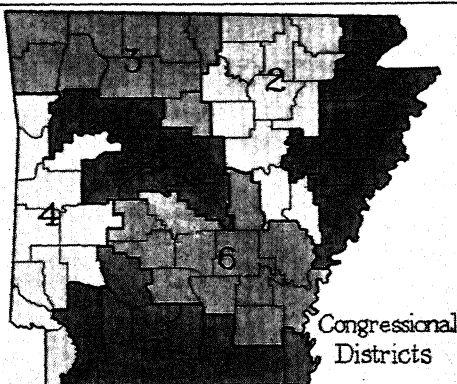
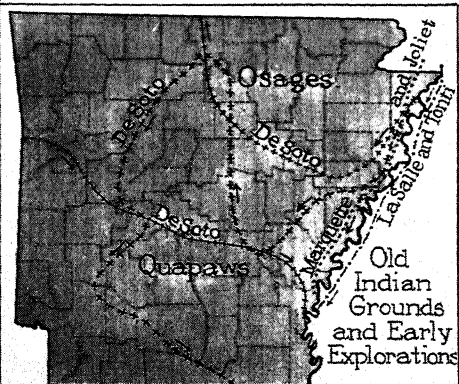
Climate. The variation in surface and difference in latitude tend to bring about a certain variation of climate. In the mountain regions, the summers are comparatively short and cool. The average temperature for the state in summer is 80 degrees; in winter, 42 degrees. While the summer is somewhat longer in the southern half of the state, and the temperatures are higher in the lowlands, the heat is tempered by the cool, salt-laden Gulf breezes, and does not seem oppressive. In the southern part of the state, the temperature in winter seldom falls below ten

degrees above zero, and snowfalls are infrequent. In the northern section, the winter temperatures occasionally fall below zero and snowfall often occurs, especially in January and February. The weather of the Ozark uplift is more like that of Missouri, while the weather of Eastern and Southern Arkansas is more like that of the Gulf states. The average annual rainfall is from forty-five to fifty inches, and is distributed quite evenly through the seasons.

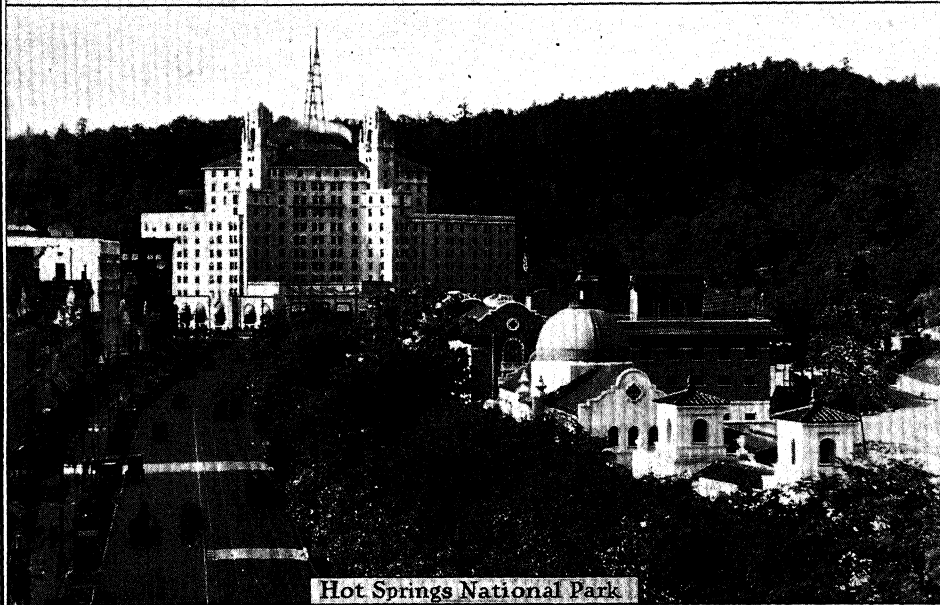
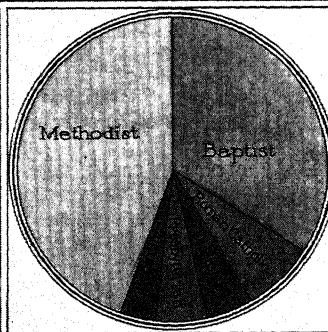
Agriculture. Its mild climate and excellent soil make Arkansas an agricultural state of importance. Upon its fertile soil the cotton ripens its flowers of silky white; from its fields come strawberries worth over a million dollars annually; and much of the rice for the country's chop suey and puddings grows in this state. Over half of the land area of the state is farm land, and half of the farm lands are improved and under cultivation. In cotton production, Arkansas stands fourth, usually, among the states, and only Louisiana exceeds it in the production of rice.

The rich delta lands of the state produce a long-staple cotton of excellent fiber and luster, much sought after by the textile industries. Rice-growing has been developed in recent years, increasing with the growth of irrigation. The rice is planted and harvested very much as is wheat in the Northern states, the plant being under water only during its growing period. Corn is an important crop, ranking about next in value to cotton. Peaches, strawberries, cantaloupes, sweet potatoes, and watermelons are among the state's miscellaneous crops. Roses for perfume are grown in many localities.

ARKANSAS



Diamond Cave, Ozark Mts.



Hot Springs National Park

Stock-Raising. Arkansas has every advantage for the raising of domestic animals, and because of its mild climate, long grazing season, pure water, abundance of feed crops, and proximity to market, is well situated for an extensive development of the dairying industry.

Mineral Resources. This is one of the most important mineral states. Its most valuable product is petroleum, which was discovered in the southern part of the state, adjacent to the Louisiana oil field, in 1921. The annual production the first year placed Arkansas fourth among the states in oil production, and with this new field much extended, it has since outranked Pennsylvania, the pioneer oil state, in total production. Natural gas is found in two separate fields—in the oil regions of Southern Arkansas and in the coal-bearing area of Western Arkansas. Next in importance is coal, of which the state produces a very fine grade of both bituminous and semi-anthracite. It is exceptional for its smokeless quality. The coal fields extend from Russellville westward through Fort Smith into Oklahoma.

From Arkansas the world obtains about ninety per cent of its supply of bauxite, the ore of aluminum. The only diamond mine on the North American continent is in Arkansas. The stones are of the finest quality, equal in every respect to those of South Africa, and one gem has been obtained which weighed seventeen carats.

Precious pearls are found in mussel shells taken from the fresh-water streams of Northern Arkansas, chiefly the White and Black rivers. Single gems have brought as high as \$7,000. The shells of the mussel are used for the manufacture of the pearl buttons of commerce.

A fine quality of the whetstone, or oilstone, which is found in the Ouachita Mountains of Southwest Arkansas is shipped to all parts of the world. This is a hard novaculite rock of many beautiful tints; long before the white man came to Arkansas, the Indians used this rock to sharpen their tomahawks, hammers, and spearheads. There are large deposits of granite near Little Rock; a great area in the north, between Black River and the Boston Mountains, is underlaid with marble; limestone and sandstone are found in various parts of the state. Zinc and lead are mined in the northwestern counties; the largest nugget of zinc ever mined came from Arkansas, and is now in the Field Museum, Chicago. Antimony, silver, iron, slate, glass sand, asphalt, chalk, fuller's earth, graphite, gypsum, ocher, and tripoli are found in the state. A phosphate rock, of low commercial value, is of importance to the farmers of the state as a fertilizer. In Saline County is found a very unusual form of kaolin clay which shows various colors.

This is made into the beautiful Niloak pottery. In this same county is the largest bed of soapstone (talc) west of the Mississippi River.

Forest Resources. This is one of the most heavily wooded of all the states. Except for a few scattered areas of prairie lands in the eastern and southern parts, the state originally was rich in woodland—in the mountain regions with oak, hickory, and cedar; in the valleys with red gum, cypress, sycamore, and white oak; and in the southern part with soft yellow pine and many varieties of hardwood. There are more than 100 different kinds of trees; about sixty varieties are of commercial use.

Arkansas is seventh among the states, in most years, in lumber production, and although it leads all the states in the production of red gum, hickory, and other important commercial timbers, almost sixty per cent of its total cut is yellow pine. Arkansas leads in the production of staves for tight barrels, and uses more timber in the manufacture of veneers than any other state. There are two national forests, the Arkansas Reserve and the Ozark Reserve. The present forest area is about 25,600,000 acres.

Manufactures. Being abundantly supplied with raw materials and possessing vast stores of cheap fuel, including oil, natural gas, coal, lignite, and wood, and with exceptional water-power possibilities, Arkansas is becoming an important manufacturing state. As might be expected, the most important industry is the manufacture of lumber and timber products, with the production of cottonseed oil and cottonseed cake usually second in value. Railroad car-repair work comprises an important industry, employing a great number of laborers.

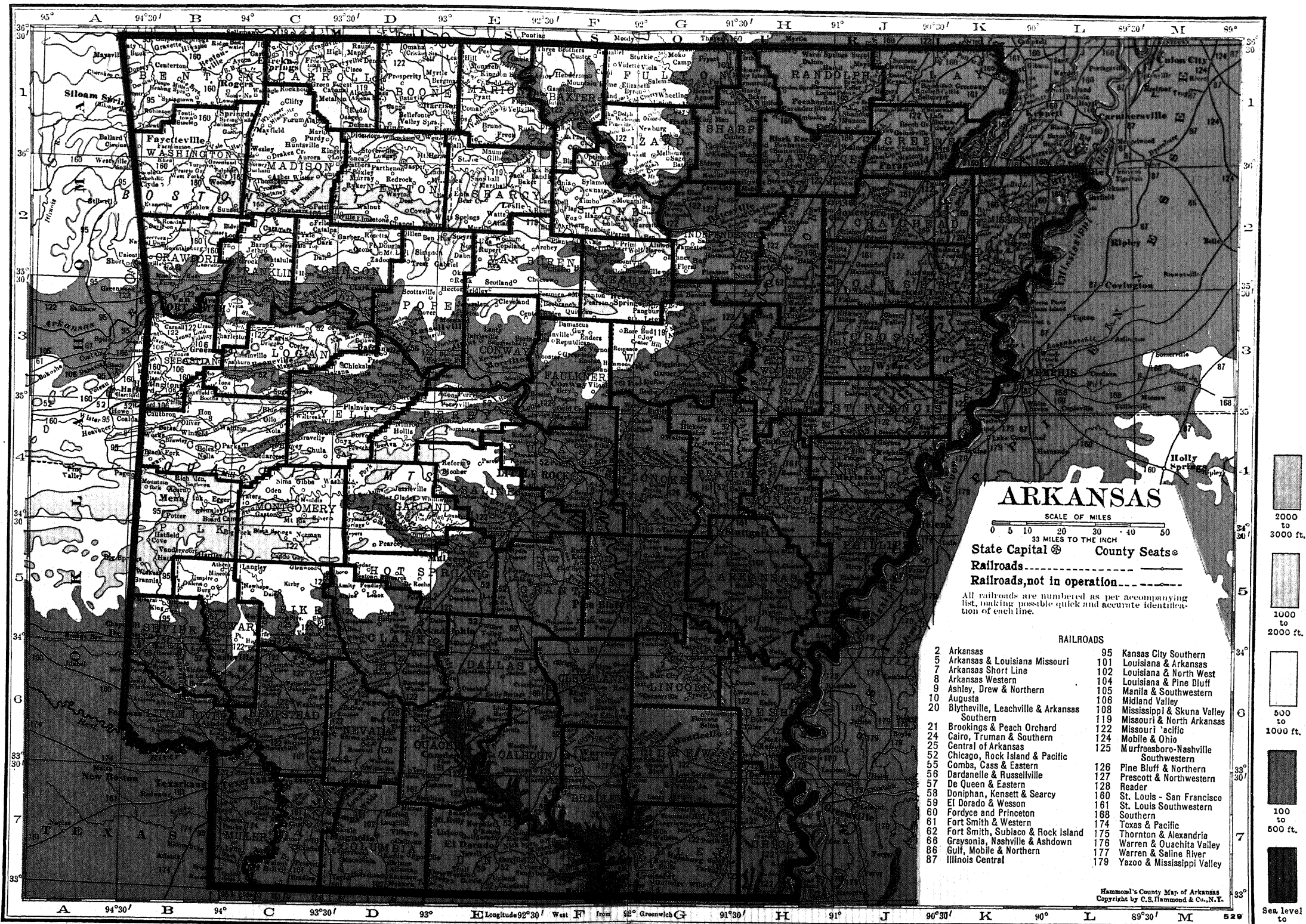
Transportation. Arkansas is well provided with river transportation, but it does not need to make use of it, for the reason that it has nearly 5,000 miles of railroad which network the state like the street-car system of a great city, reaching into seventy-four of the seventy-five counties and touching every center of traffic production. There is little traffic on the waterways, except for a few steamers that ply the Mississippi. Among the principal trunk lines are the Missouri Pacific; the Saint Louis Southwestern, or Cotton Belt Route; the Rock Island; the Saint Louis & San Francisco; and the Kansas City Southern.

Little Rock is the railroad center of the state; lines radiate from the city northward to Saint Louis, eastward to Memphis, southward to New Orleans, Galveston, and Dallas, and westward to Kansas City, Omaha, and Denver.

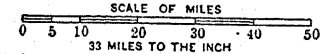
Government. Arkansas has had three constitutions; the one under which it is now governed was adopted in 1874. It provides for an executive department consisting of gover-

ARKANSAS

Abbott, (B3).....	300	Biscoe, (H4).....	250	Cincinnati, (A1).....	100	Elm Springs, (B1).....	300	Hardy, (H1).....	399
Ada, (E3).....	100	Bismarck, (D5).....	100	Clarendon, (H4).....	2,638	El Paso, (F3).....	200	Harlow, (E6).....	100
Adona, (E3).....	241	Black Fork, (B4).....	100	Clarkedale, (K3).....	250	Emerson, (D7).....	357	Harrell, (F7).....	300
Ain, (F5).....	100	Black Oak, (K2).....	250	Clarksville, (D3).....	2,127	Ermet, (D6).....	420	Harrisburg, (J2).....	1,315
Alco, (F2).....	200	Blackrock, (H1).....	835	Cleveland, (E3).....	159	England, (F4).....	2,408	Harrison, (D1).....	3,477
Alexander, (E4).....	111	Black Springs, (C5).....	150	Clinton, (F2).....	350	Enlish, (G5).....	250	Hartford, (B3).....	2,067
Algoa, (H2).....	304	Blackton, (H4).....	150	Coaldale, (B4).....	200	Enola, (F2).....	100	Hartman, (C3).....	500
Alicia, (H2).....	297	Blanchard Springs, (F7).....	150	Coal Hill, (C3).....	1,057	Esau, (E3).....	202	Hatfield, (B5).....	335
Alix, (C3).....	350	Blevins, (C6).....	350	Collins, (G6).....	171	Eudora, (H7).....	197	Havana, (B3).....	449
Alleene, (B6).....	130	Blissville, (G7).....	391	Colt, (J3).....	265	Eureka Sprs., (C1).....	2,129	Haynes, (F1).....	350
Allis, (G6).....	100	Blue Mountain, (C3).....	200	Columbus, (C6).....	200	Evadale, (K2).....	150	Hazen, (G4).....	783
Alma, (B3).....	779	Bluff City, (D6).....	125	Combs, (C2).....	200	Evansville, (B2).....	150	Healing Sprs., (B1).....	100
Almond, (G2).....	300	Bluffton, (C4).....	100	Conway, (F3).....	4,564	Evening Shade, (G1).....	290	Heber Springs, (F3).....	1,675
Almyra, (H5).....	323	Blytheville, (L2).....	6,447	Cornertone, (G5).....	250	Everton, (E1).....	170	Hector, (E3).....	120
Alpena Pass, (D1).....	250	Bodcaw, (D6).....	200	Cornerville, (J3).....	130	Fairoaks, (J3).....	53	Helena, (F4).....	9,112
Alpine, (D5).....	100	Bonanza, (B3).....	516	Cotter, (E1).....	884	Fairview, (E6).....	100	Hensley, (F4).....	500
Alzheimer, (G5).....	450	Bono, (J2).....	200	Cottonplant, (H3).....	1,661	Falcon, (D3).....	100	Hermiteage, (F7).....	285
Altus, (C3).....	709	Booneville, (C3).....	2,199	Countiss, (J5).....	150	Famous, (D7).....	100	Hickman (L2).....	150
Aly, (D4).....	125	Boston, (C2).....	150	Cove, (B5).....	400	Farmington, (B1).....	170	Hickory Plains, (G4).....	250
Amity, (D5).....	680	Boughton, (D6).....	100	Crawfordville, (K3).....	605	Fayetteville, (B1).....	5,362	Hickoryridge, (J3).....	130
Amos, (F1).....	150	Boydell, (H7).....	500	Crittenden, (J3).....	100	Felsenthal, (F7).....	167	Higden, (F2).....	220
Antoine, (D5).....	300	Boydsville, (K1).....	200	Crosses, (C2).....	100	Fir, (D4).....	100	Higginson, (G3).....	239
Aplin, (E4).....	200	Boynton, (K2).....	350	Crossett, (G7).....	2,707	Fisher, (J3).....	350	Hillsboro, (E7).....	100
Appleton, (E3).....	300	Bradford, (H3).....	342	Culp, (F1).....	160	Flippin, (E1).....	225	Hilltop, (D1).....	100
Archillion, (L2).....	100	Bradley, (C7).....	290	Cummins, (G5).....	275	Fordece, (E6).....	2,996	Hindsville, (C1).....	225
Arden, (B6).....	250	Branch, (B3).....	370	Curtis, (D5).....	200	Foreman, (B6).....	1,408	Hiram, (G3).....	150
Arkadelphia, (E5).....	3,311	Brasfield, (H4).....	200	Cushman, (G2).....	349	Forest City, (F4).....	3,377	Hiwassee, (B1).....	130
Arkana, (F1).....	200	Brentwood, (B2).....	100	Dabney, (E2).....	200	Fort Smith, (B3).....	31,643	Hobbs, (B2).....	100
Arkansas City, (H6).....	1,482	Brighton, (K1).....	200	Daisy, (C5).....	130	Fouke, (C7).....	319	Holland, (F3).....	200
Arkansas Post, (H5).....	100	Brinkley, (H4).....	2,714	Dalark, (E5).....	264	Fountainhill, (G7).....	100	Hollis, (D4).....	100
Arkincia, (B6).....	148	Brockett, (J1).....	140	Damascus, (F3).....	100	Fourche, (E3).....	164	Hollygrove, (H4).....	977
Armada, (B2).....	300	Brookings, (J1).....	100	Danville, (D3).....	833	Fourche Dam, (F4).....	120	Holly Springs, (E6).....	110
Armored, (L2).....	300	Brookland, (J2).....	326	Dardanelle, (D3).....	1,835	Franklin, (G1).....	150	Hollywood, (D5).....	180
Ashdown, (B6).....	2,052	Brownstown, (B6).....	200	Datto, (J1).....	242	Franklin, (G1).....	150	Homan, (C6).....	250
Ash Flat, (G1).....	150	Bruins, (K4).....	148	Dayton, (B3).....	100	Fredonia, (H4).....	310	Hon, (B4).....	160
Ashton, (H7).....	200	Bruno, (E1).....	100	De Ann, (C6).....	100	Friendship, (D5).....	285	Hope, (C6).....	4,790
Askew, (J4).....	31	Bryant, (E4).....	132	Decatur, (A1).....	424	Frostville, (C7).....	11	Horatio, (B6).....	1,098
Athelstan, (K2).....	100	Buckner, (D7).....	360	Deckerville, (K3).....	63	Fulton, (C6).....	543	Hot Springs, (D4).....	11,695
Athens, (B5).....	98	Buckrange, (C6).....	220	Dee, (J2).....	100	Gainsville, (J1).....	300	Houston, (E3).....	403
Atkins, (E3).....	1,529	Buena Vista, (D7).....	180	Deer, (D2).....	250	Garfield, (C1).....	150	Howell, (H3).....	750
Atlanta, (D7).....	150	Buffalo, (E1).....	200	Delaney, (C2).....	150	Garland, (C7).....	370	Hoxie, (H1).....	1,711
Aubrey, (J4).....	250	Burdette, (K2).....	100	Delaplaine, (J1).....	152	Garner, (G3).....	150	Hudspeth, (G7).....	131
Augusta, (H3).....	1,731	Butler, (L2).....	250	Delight, (C5).....	391	Garretson, (G5).....	200	Huffman, (L2).....	100
Aurora, (C1).....	100	Cabool, (F5).....	100	Dell, (L2).....	233	Gassville, (F1).....	191	Hughes, (J4).....	451
Austin, (F3).....	163	Cabot, (G4).....	477	Denning, (C3).....	608	Gentry, (A1).....	724	Humphrey, (G5).....	554
Auvergne, (H2).....	150	Caddo Gap, (C5).....	200	Denver, (D1).....	200	Gethsemane, (G5).....	250	Hunt, (C2).....	100
Ava, (D4).....	100	Calamine, (H1).....	130	De Queen, (B5).....	2,517	Gifford, (E5).....	200	Hunter, (H3).....	343
Avoca, (B1).....	100	Calico Rock, (F1).....	479	Dermott, (H6).....	2,330	Gill, (J4).....	100	Huntington, (B3).....	1,453
Balboa, (H1).....	200	Calion, (E7).....	100	Deroche, (D5).....	100	Gillett, (H5).....	1,155	Huntingville, (C1).....	540
Bald Knob, (G3).....	958	Camden, (E6).....	3,238	Desarc, (G4).....	1,307	Gillham, (B3).....	317	Huttig, (F7).....	1,261
Banks, (F6).....	347	Camp, (G1).....	120	De Valls Bluff, (G4).....	885	Gilmore, (K5).....	250	Imboden, (H1).....	630
Banner, (G2).....	100	Canehill, (B2).....	100	De View, (H3).....	100	Glenwood, (C5).....	891	Luka, (F1).....	200
Barber, (B3).....	100	Canfield, (C7).....	100	De Witt, (H5).....	1,422	Golden Lake, (L2).....	100	Jacksonport, (H2).....	318
Bardstown, (K2).....	200	Carrie, (E7).....	245	Diaz, (H2).....	100	Goshen, (B1).....	130	Jacksonville, (F4).....	250
Barfield, (L2).....	100	Carlisle, (G4).....	602	Dierks, (B5).....	1,495	Gould, (H6).....	318	Jakajones, (C6).....	100
Barling, (B3).....	100	Carrollton, (D1).....	150	Dodd City, (E1).....	250	Grace, (F5).....	100	Jamestown, (G2).....	126
Barton, (J4).....	250	Carthage, (E5).....	532	Doddridge, (C7).....	250	Grady, (G5).....	398	Jasper, (D2).....	253
Bates, (B4).....	224	Casa, (D3).....	300	Donaldson, (E5).....	100	Grandfield, (C5).....	170	Jannette, (J3).....	200
Batesville, (G2).....	4,299	Cash, (J2).....	150	Douglas, (H5).....	151	Grand Lake, (H7).....	250	Jenny Lind, (B3).....	500
Bauxite, (E4).....	300	Cass, (C2).....	100	Dover, (D3).....	388	Grannis, (B5).....	450	Jericho, (K3).....	200
Baxter, (G6).....	200	Casscoe, (G5).....	120	Drakes Creek, (C1).....	200	Grapevine, (F5).....	200	Jerome, (E5).....	400
Bay, (J2).....	500	Cato, (F4).....	120	Draydon, (F6).....	300	Graphic, (B2).....	100	Jerusalem, (E3).....	150
Bayou Meto, (H5).....	100	Caulksville, (C3).....	150	Dryden, (J2).....	137	Grassy Lake, (K3).....	100	Johnson, (B1).....	160
Bay Village, (J3).....	100	Cauthron, (B4).....	300	Dumas, (H6).....	1,124	Gravelly, (C4).....	130	Johnsonville, (J4).....	88
Bear, (D4).....	150	Cave City, (G2).....	243	Dunnington, (H2).....	100	Gravette, (B1).....	754	Johnsville, (F7).....	100
Bearden, (E6).....	687	Cedarglades, (D4).....	100	Dutton, (C2).....	130	Grays, (H3).....	136	Joiner, (K2).....	200
Beaver, (C1).....	150	Cedarville, (B2).....	54	Dyer, (B2).....	609	Graysonia, (D5).....	700	Jonesboro, (J2).....	9,384
Beebe, (G3).....	995	Center, (G1).....	100	Eagle Mills, (E6).....	600	Greenbrier, (F3).....	250	Judsonia, (G3).....	899
Beebranch, (F3).....	88	Centerpoint, (C5).....	276	Eagleton, (B4).....	100	Greenfield, (J2).....	300	Junction City, (E7).....	653
Beirne, (D6).....	500	Center Ridge, (E3).....	212	Eago, (E2).....	100	Greenland, (B2).....	147	Kearney, (F5).....	150
Belcher, (G3).....	100	Centerton, (B1).....	212	Earl, (K3).....	2,091	Greenway, (K1).....	362	Kedron, (F5).....	130
Bellefonte, (D1).....	300	Cerroville, (D3).....	250	Echo, (B3).....	100	Greenwood, (B3).....	1,374	Kelso, (E3).....	231
Belleville, (D3).....	410	Cerrigordo, (A6).....	250	Edgemont, (F2).....	134	Griffin, (E7).....	150	Kensett, (G3).....	480
Belton, (C6).....	100	Chambersville, (F6).....	120	Edmondson, (K3).....	325	Griffithville, (G3).....	219	Kenyon, (H2).....	100
Ben Lomond, (B6).....	431	Champagnolle, (F7).....	100	Egger, (B4).....	100	Grubbs, (H2).....	300	Keo, (G4).....	325
Benton, (E4).....	2,933	Chapel Hill, (A3).....	190	Egypt, (H2).....	100	Guion, (G2).....	260	Kerrs, (F4).....	300
Bentonville, (B1).....	2,313	Charleston, (B3).....	734	Elaine, (J5).....	377	Gurdon, (D6).....	1,469	Kimberly, (C5).....	121
Bergman, (E1).....	150	Cherry Valley, (J3).....	300	Eldorado, (E7).....	3,887	Guy, (F3).....	200	King, (B5).....	150
Berryville, (D1).....	1,474	Chester, (B2).....	223	Elizabeth, (F1).....	200	Hackett, (B3).....	398	Kingdon Sprs., (E1).....	100
Bertig, (K1).....	300	Chickalah, (D3).....	200	Elkins, (C1).....	100	Hagarville, (D2).....	150	Kingsland, (F6).....	397
Bethesda, (G2).....	200	Chickasawba, (L2).....	250	Elliot, (E7).....	130	Halley, (H6).....	264	Kingston, (C1).....	150
Bigelow, (E3).....	589	Chidester, (E6).....	280	Elmore, (E5).....	200	Halliday, (K1).....	100	Kirby, (C5).....	100
Biglat, (F1).....	125	Chula, (C4).....	150			Hamburg, (G7).....	1,538	Knob, (K1).....	150
Biggers, (J1).....	447					Hampton, (E6).....	271	Knobel, (J1).....	390
Biglake, (K2).....	250								



ARKANSAS



State Capital County Seats

Railroads

Railroads, not in operation

All railroads are numbered as per accompanying list, making possible quick and accurate identification of each line.

RAILROADS

- | | |
|--|---|
| 2 Arkansas | 95 Kansas City Southern |
| 5 Arkansas & Louisiana Missouri | 101 Louisiana & Arkansas |
| 7 Arkansas Short Line | 102 Louisiana & North West |
| 8 Arkansas Western | 104 Louisiana & Pine Bluff |
| 9 Ashley, Drew & Northern | 105 Manila & Southwestern |
| 10 Augusta | 106 Midland Valley |
| 20 Blytheville, Leachville & Arkansas Southern | 108 Mississippi & Skuna Valley |
| 21 Brookings & Peach Orchard | 119 Missouri & North Arkansas |
| 24 Cairo, Truman & Southern | 122 Missouri Pacific |
| 25 Central of Arkansas | 124 Mobile & Ohio |
| 52 Chicago, Rock Island & Pacific | 125 Murfreesboro-Nashville Southwestern |
| 55 Combs, Cass & Eastern | 126 Pine Bluff & Northern |
| 56 Dardanelle & Russellville | 127 Prescott & Northwestern |
| 57 De Queen & Eastern | 128 Reader |
| 58 Doniphan, Kensett & Searcy | 160 St. Louis - San Francisco |
| 59 El Dorado & Wesson | 161 St. Louis Southwestern |
| 60 Fordyce and Princeton | 168 Southern |
| 61 Fort Smith & Western | 174 Texas & Pacific |
| 62 Fort Smith, Subiaco & Rock Island | 175 Thornton & Alexandria |
| 68 Grayson, Nashville & Ashdown | 176 Warren & Ouachita Valley |
| 86 Gulf, Mobile & Northern | 177 Warren & Saline River |
| 87 Illinois Central | 179 Yazoo & Mississippi Valley |

Hammond's County Map of Arkansas
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2000 to 3000 ft.

1000 to 2000 ft.

500 to 1000 ft.

100 to 500 ft.

Sea level to 100 ft.

ARKANSAS *Continued*

Knowlton, (H5)...	250	Monette, (K2)....	1,066	Penrose, (J3).....	100	Saratoga, (C6)....	400	Uniontown, (A2)..	200
Knowlton, (D3)....	300	Monroe, (H4)....	100	Perla, (E5).....	250	Sayre, (D6).....	150	Upland, (E7).....	33
Lacey, (G7).....	100	Montana, (C3)...	100	Perry, (E3).....	540	Scanlan, (K3)...	100	Valley Junction,	
Laconia, (J5)...	130	Monte Ne, (B1)...	86	Perryville (E3)...	665	Schaal, (C6)....	100	(G6).....	100
La Crosse, (G1) ..	100	Monticello, (G6)..	2,378	Pettigrew, (C2)...	450	Seckman, (E2)...	220	Valley Springs,	
Ladd, (G5).....	200	Montrose, (H7)...	404	Pfeiffer, (G2)....	100	Scott, (F4).....	100	(D1).....	200
Ladelle, (G1)....	135	Moreland, (E3)...	100	Piggott, (K1)....	2,016	Scranton, (D3)..	100	Van Buren, (B3) ..	5,224
Lagrange, (J4)...	310	Morganton, (F3)..	150	Pike, (C5).....	229	Scranton, (C3)...	400	Vandervoort, (B5).	350
Lake City, (K2)...	635	Moro, (J4).....	265	Pindall, (E1)....	200	Searcy, (G5)....	2,836	Vandale, (J3)....	500
Lake Dick, (G5)...	150	Morell, (G7)....	500	Pine Bluff (F5)...	21,611	Sedgewick, (J2) ..	195	Varnes, (G5).....	194
Lake Farm, (G5)...	200	Morrilton, (E3)...	3,010	Piney, (D3).....	120	Selma, (C6).....	130	Vick, (F7).....	250
Lake Village, (H7).	1,449	Morris Ferry, (B6).	100	Pinnacle, (E4)...	100	Settlement, (F2)...	150	Victor, (G2).....	200
Lamar, (D3).....	542	Morrison Bluff,		Pitts, (J2).....	150	Seyppel, (K4)...	250	Village, (D7)....	100
Lambethville, (K3)	100	(D3).....	100	Plainview, (D3)...	990	Shendan, (F5)...	695	Vincent, (K3)...	200
Lanark, (F6).....	120	Mountainburg, (B2).	170	Pleasant Plains		Sherrill, (G5)...	350	Vineyard, (J4)...	250
Landis, (F2)....	150	Mountain Home,		(G2).....	116	Shiloh, (F2)....	232	Viola, (G1)....	280
Laneburg, (D6)...	100	(F1).....	492	Plumerville, (E3).	702	Shirley, (F2)....	319	Wabash, (J5)....	100
Lane Hill, (B3)...	180	Mountain View,		Pocahontas, (H1) ..	1,806	Sidney, (G1)....	100	Wabuseka, (G5).	350
Langford, (G5)...	100	(F2).....	342	Poole, (F6).....	100	Sidon, (G3)....	100	Walcott, (J1)...	85
Langley, (C5)...	125	Mount Ida, (C4)...	298	Poplar Grove, (J4).	150	Silica, (E4).....	200	Waldo, (D7)....	704
Lapile, (F7)....	160	Mount Nebo, (D3) ..	10	Portia, (H1)....	519	Slimo Sprs, (A1) ..	2,569	Waldron, (B4) ..	918
Lavaca, (B3)....	350	Mount Olive, (F1) ..	100	Portland, (G7)...	618	Slocum, (E4)....	150	Walnut Hill, (D7).	300
Lawson, (F7)....	150	Mount Pisgah, (G3)	100	Pottsville, (E3) ..	275	Smackover, (E7)...	100	Walnut Lake,	
Leadhill, (E1)...	218	Mount Peasant,		Poughkeepsie, (G1)	200	Smithdale, (J3) ..	100	(H6).....	100
Leola, (E5).....	482	(G2).....	300	Powhatan, (H1)...	134	Smithville, (H1)...	300	Walnut Ridge, (J1)	2,226
Lepanto, (K2)...	986	Mount Vernon,		Prairie Creek, (B3)	300	Snow Lake (H5)...	131	Walnut Tree, (C3).	200
Leslie, (F2)....	1,472	(F3).....	250	Prairie Grove, (B2)	861	South Bend, (H5).	684	Ward, (G3).....	130
Lester, (E6)....	100	Mulberry, (B2)...	1,095	Prairie View, (D3).	200	South Fork, (G1).	150	Wareagle, (C1)...	200
Letona, (G3)....	252	Murfreesboro,		Prattville, (E5)...	100	Spadra, (C3)....	560	Warm Springs,	
Levy, (F4).....	673	(C5).....	730	Prescott, (D6)...	2,691	Sparkman, (E6)...	561	(H1).....	100
Lewisville, (D7)...	1,067	Nashville, (C6)...	2,144	Princeton, (E6)...	191	Spierville, (C3) ..	100	Warren, (F6)....	2,145
Limestone, (D2)...	100	Natural Steps,		Proctor, (K3)....	100	Spotville, (E7)...	100	Washington, (C6).	556
Lincoln, (B2)...	534	(E4).....	100	Provo, (B5).....	200	Springdale, (B1) ..	2,263	Watson, (H6)....	254
LITTLE ROCK,		Neal Springs, (B6)	200	Pulaski Heights,		Springfield, (E3) ..	300	Webb City, (C3)...	200
(F4).....	79,200	Nettleton, (J2)...	888	(F4).....	683	Springhill, (C6)...	100	Weiner, (J2)....	412
Lockesburg, (B6).	794	Newark, (H2)....	906	Quitman, (F3)...	366	Springtown, (B1)...	140	Weldon, (H3)...	250
Lollie, (E3).....	100	Newburg, (F1)....	100	Raggio City, (J4).	65	Stamps, (D7)....	2,564	Wesley, (C1)....	100
London, (C3)....	386	New Edinburg,		Ratcliff, (C3)...	257	Staple, (H5)....	200	Wesson, (E7)....	716
Lonoke, (G4)....	1,711	(F6).....	440	Ravana, (B7)....	200	Star City (G6)...	616	Western Grove,	
Lonsdale, (E4)...	166	Newhope, (C5)...	130	Ravenden, (H1)...	350	Staves, (E5)....	150	(E2).....	100
Lost Prairie, (C7).	300	New Lewisville,		Ravenden Springs,		Stephens, (F7)...	769	West Fork (B2)...	343
Lowell, (B1)....	227	(C7).....	975	(H1).....	191	Sterling, (H7)...	200	West Hartford,	
Lucky, (D5)....	100	New London, (F7) ..	100	Readland, (H7)...	172	Strawberry, (H2)...	100	(B4).....	200
Lumber, (D7)....	150	Newport (H2)...	3,771	Rector, (K1)....	1,801	Strong, (F7)....	507	West Helena, (J4).	6,226
Lunsford, (K2)...	150	Nimmons, (K1)...	297	Redfield, (F5)...	296	Stuttgart, (H4)...	4,522	West Memphis,	
Luxora, (L2)....	1,179	Noble Lake, (G5) ..	100	Red Fork (H6)...	150	Subacio, (C3)....	181	(K3).....	350
McArthur, (H6)...	100	Norfolk, (F1)....	224	Redleaf, (H7)...	100	Success, (J1)....	436	West Point, (G3)...	162
McCaskill, (C6)...	180	Norphlet, (E7)...	110	Redrock, (D2)...	100	Sugar Grove, (C3).	200	Wheatley, (H4)...	477
McCrary, (H3)...	687	North Little Rock		Reed, (H1).....	100	Sulphur Rock, (H2)	227	Whelan Springs,	
McDaniel, (J4)...	100	(F4).....	15,696	Refuge, (H6)...	100	Sulphur Sprs, (B1)	470	(D6).....	137
McGehee, (H6)...	2,368	Norvell, (K3)...	522	Rommel, (H2)...	300	Summit, (E1)....	150	White Cliffs, (B6).	42
McNab, (C6)....	147	Oakland, (K1)....	100	Reyno, (J1)....	392	Sunnyside, (H7)...	500	Whitener, (C1)...	100
McNeil, (D7)....	448	Oakleaf, (E5)...	100	Rhea, (B2).....	100	Supply, (J1)....	150	Wickes, (B5)....	200
McRae, (G3)....	467	Oden, (C4).....	125	Riceville, (K3)...	100	Swan Lake (G5)...	250	Wideman, (F1)...	200
Maberry, (H3)...	100	Ogamaw, (E7)....	200	Richmond, (B6)...	300	Sweet Home (F4)...	100	Widener, (J3)...	449
Madison, (J3)...	670	Ogden, (B6)....	397	Rich Mountain,		Swifton, (H2)...	450	Wild Cherry, (G1)	150
Magazine, (C3)...	772	Okean, (J1)....	205	(B4).....	100	Taylor, (D7)....	275	Wilcoxon, (D2)...	100
Magness, (G2)...	199	Okolona, (D6)...	492	Rison, (F6)....	685	Texarkana, (C7) ..	8,257	Willford, (H1)...	357
Magnolia, (D7)...	2,158	Ola, (D3).....	655	Riverside, (H3)...	100	Thomasville, (J4).	200	Wilmar, (G6)....	1,034
Malvern, (E5)...	3,864	Olyphant, (H2)...	120	Robroy, (G5)...	150	Thorney, (C2)...	100	Wilmot, (G7)....	627
Mammoth Spr.,		Oma, (D5).....	100	Rocky Comfort,		Thornton, (F6)...	1,312	Wilson, (K2)....	500
(G1).....	700	Omaha, (D1)....	500	(B6).....	612	Three Creeks, (E7)	150	Wilton, (B6)....	285
Mandeville, (C7)...	200	Osage, (D1)....	140	Rodney, (F1)....	100	Tillar, (H6).....	350	Winchester, (G6).	217
Manila, (K2)....	971	Osage Mills (B1)...	110	Roe, (H4).....	100	Timbo, (F2)....	100	Wing, (C4).....	150
Manning, (E5)...	348	Oseola, (K2)....	1,755	Rogers, (B1)...	3,318	Tinsman, (F6)...	248	Winslow, (B2)...	264
Mansfield, (B3)...	923	Owensville, (E4) ..	110	Rohwer, (H6)...	49	Tokio, (C6).....	100	Winthrop, (B6)...	250
Marcella, (G2)...	100	Oxford, (G1)....	110	Rondo, (J4)....	150	Tollville, (H4)...	100	Witcherville, (B3).	110
Marianna, (J4)...	5,074	Ozan, (C6).....	155	Rosboro, (D5)...	412	Tombelins, (G4)...	100	Witherspoon, (D5)	130
Marton, (C3)....	300	Ozark, (C3)....	1,262	Rose Bud (G3)...	110	Tontitown, (B1)...	235	Wiville, (H3)....	100
Marked Tree, (J2)	1,318	Palestine, (J4)...	297	Rosston, (D6)...	200	Tracy, (F1).....	100	Womble, (C5)...	420
Marmaduke, (K1).	861	Pangburn, (G3)...	706	Round Pound, (J3)	180	Traskwood, (E5)...	256	Woodberry, (E6)...	100
Marshall, (E2)...	749	Paragould, (J1)...	6,306	Rover, (D4)....	200	Trenton, (J4)....	150	Woodson, (F4)...	300
Marvell, (J4)....	781	Paraloma, (C6)...	499	Royal, (D4)....	200	Troy, (D6).....	100	Wooster, (F3)...	100
Maumee, (E1)...	100	Paris, (C3)....	1,740	Ruddells (F2)...	100	Trumann, (K2)...	2,598	Wrightsville, (F4).	300
Maynard, (J1)...	210	Parkdale, (G7)...	284	Rudy, (B2)....	150	Tucker, (G5)....	200	Wyandot, (K3)...	200
Maysville, (A1)...	300	Parkin, (J3)....	1,378	Russell, (H3)...	172	Tuckerman, (H2) ..	778	Wynne, (J3)....	2,933
Meg, (C3).....	160	Parquet, (H2)...	100	Russellville, (E3)...	4,505	Tulip, (E5).....	180	Yarbo, (L1)....	125
McBourne, (G1)...	295	Patmos, (D6)....	150	Saginaw, (E5)...	250	Tupelo, (H3)....	317	Yellville, (E1)...	615
Mena, (B4)....	3,441	Patterson, (H3)...	261	Saint Charles, (H5)	200	Turner, (H5)....	100	Yrktown, (G5)...	180
Midland, (B3)...	787	Peach Orchard,		Saint Francis, (K1)	501	Turrell, (K3)....	200	Youngtown, (G5).	136
Millard, (D3)...	200	(J1).....	484	Saint James, (G2).	300	Tuttleton, (J4)...	100	Zebulon, (C5)...	100
Miller, (F3)....	100	Pearcy, (D6)....	200	Saint Joe (E1)...	181	Tyro, (G6).....	150	Zinc, (E1).....	144
Millville, (E6)...	900	Pear Ridge, (B1) ..	200	Saint Paul, (C2)...	284	Tyronza, (K3)...	250		
Mineral Sprs., (B6)	777	Pecan Point, (L3).	200	Salado, (G2)....	110	Ulm, (H4).....	194		
Minturn, (J2)...	278	Pekin, (K2)....	150	Salem, (G1)....	800	Umpire, (B5)...	128		
Moark, (J1).....	110	Pennington, (J2)...	250	Sans Souci, (L2) ..	160	Union, (G1)....	200		

QUESTIONS ON ARKANSAS

(An Outline suitable for Arkansas will be found with the article "State.")

Has Arkansas many or few miles of navigable rivers? Are they important channels for the state's commerce?

What are "ox-bows," and where are they to be found?

What was the origin of the wondrous tales which brought Ponce de Leon to America?

Who was the first white man to set foot on the soil of Arkansas?

What may have been the reason for his coming to this region?

To how many countries has the territory comprised in this state belonged?

Give two nicknames of the state and tell the origin of each.

What is the state flower?

Has the state more or fewer people to the square mile than the United States as a whole?

What river of Arkansas, in its earlier stages, before it enters the state, flows through one of the most famous canyons in the country?

Which are the important crops of Arkansas?

Do the large proportion of the people live in towns or in the country?

What specially beautiful scenic region has Arkansas?

What state, larger than Arkansas, was part of the latter when it was first organized?

What cities have had a particularly rapid growth in recent years?

Do the rivers furnish anything of value except transportation and water power?

What do the long summers make possible?

Why has rice culture increased so noticeably in recent years?

What is the "Baden-Baden of America"?

What special facilities has the state for stock-raising, and what advantage is being taken of them?

What mineral product of Arkansas is unsurpassed elsewhere in the world?

If a botanist were confined in his labors to this one state, could he learn about many trees?

What three things are needed to make possible extensive manufactures? Which of them, if any, does Arkansas lack?

How does Arkansas compare with Georgia in its negro population? With New Mexico in foreign population?

Would you class Arkansas as a Western or a Southern state?

Name a scenic attraction in the state which is similar to one in Kentucky.

In which section of the state is cotton chiefly grown?

What theory has been given for the presence of Hot Springs? What may be the origin of Mammoth Springs?

Is Arkansas more important as a mining or an agricultural state?

What precious gems are found in the state? What mineral is of value to the farmers?

Name four famous explorers who visited this region in the early days.

Where is the first marble shipped from the state?

On which side did Arkansas fight in the War of Secession? Why was there delay in readmitting the state to the Union?

What great river forms one of the boundaries of the state?

What implement was once humorously referred to as the "Arkansas toothpick"?

What was the District of New Madrid?

What scientific theory has been rejected as a subject to be taught in the schools of the state, by popular vote?

nor, lieutenant-governor, secretary of state, treasurer, auditor, and attorney-general, each of whom holds office for two years.

The legislature comprises the usual two houses—a senate of thirty-five members and a house of representatives of 100 members. Senators are elected for four years, representatives for two, and a session of the legislature may not last longer than sixty days unless a two-thirds vote of each house decrees otherwise.

At the head of the judiciary is a supreme court, and the lower tribunals include circuit, county, and probate courts, besides justices of the peace. The units for local government are the county and the township.

Amendments and legislative acts have added certain distinctive features to the governmental system. In 1893 an amendment was passed making the right of suffrage conditional upon payment of a poll tax; in 1911 an initiative and referendum provision was made. Laws recently passed legalize coöperative associations for marketing, and provide for a marketing bureau and a seed-inspection bureau. The state has been Democratic since 1874.

History. Before the coming of the white man two great tribes of Indians lived in the Arkansas region—the Osages, who lived north of the Arkansas River, and the Quapaws, or Arkansas, as they were called by the French, who lived to the south. It was from this latter tribe that the territory took its name. It was not until the early years of the nineteenth century, after the United States had gained control of the region, that these two native tribes finally left the state. The famous De Soto was the first white man to enter the territory now included in Arkansas; he spent about ten months there, journeying as far from the Mississippi as the Ozarks and the present site of Hot Springs. Indeed, it may have been tales of these springs which lured him so far from the Gulf. Some historians hold that the great explorer was buried in the Arkansas River, but most authorities believe that it was into the Mississippi that his body was lowered. See DE SOTO, FERNANDO.

For over a century after his death, no white man visited the region. In 1673 Marquette and Joliet came down the Mississippi almost to the mouth of the Arkansas River. In 1682 La Salle took possession of the region in the name of France. Four years later French traders established a settlement at Arkansas Post, not far from the mouth of the Arkansas River, but no attempt was made to open up the wilderness. Ceded by France to Spain in 1763, and in 1800 back again to France, Arkansas came into the possession of the United States in 1803 as part of the Louisiana Purchase (which see). In 1805, what is now Arkansas and the lower part of Missouri were organized

as the District of New Madrid; in 1812 the state was part of the Territory of Missouri, but in 1819 it was organized as Arkansas Territory. In 1836 it was admitted to the Union as the twenty-fifth state, and for a time its growth was rapid.

When the War of Secession began, there was doubt as to which side the state would join, for though slavery existed within its borders its population was fairly evenly divided between Northern and Southern sympathizers. Secession was decided upon, however, and several battles during the war occurred within the boundary of the state. Little Rock was captured by the Union forces in September, 1863, and in the next year a constitution was adopted which prohibited slavery. This was rejected by Congress, however; the action was due largely to the reconstruction quarrel in Congress, and not until 1868 was the state readmitted to the Union (see RECONSTRUCTION).

Meanwhile, the carpetbaggers had come, with the evils which always attended them, and strife ran high between the carpetbag faction and the "reformers" (see CARPETBAGGERS). In 1874, during the election of a governor, civil war was averted only by Federal aid. With the adoption in that year of the present constitution, an era of renewed peace and progress began for the state which had for more than a decade been harassed and retarded in its development.

During recent years, the history of the state shows steady progress in the development of resources and industries. J.P.W.

Other Items of Interest. The bowie knife, first made in Arkansas for a brother of James Bowie of Alamo fame, has been jocosely referred to as the "Arkansas toothpick."

In early days bears were numerous, as the old popular name of the state would indicate.

The first marble shipped from Arkansas was a block weighing 9,000 pounds. It is the Arkansas stone in the Washington Monument.

The *Arkansas Gazette* was the first paper in the Territory of Arkansas.

In 1928, by popular vote, the teaching of evolution was forbidden in the state.

In the Little River country, great cliffs over 150 feet high, of pure white chalk, are found. It is estimated that the chalk here would supply the world for several generations.

The apple blossom is the official state flower.

Related Subjects. The reader who desires a more detailed knowledge of Arkansas will find the following articles helpful, and reference to them is suggested:

CITIES AND TOWNS

Little Rock is described in its place in these volumes. For other cities important in the state, see back of state map.

HISTORY

Carpetbaggers	Indians, American
Louisiana Purchase	Reconstruction

MOUNTAINS

Ozark

LEADING PRODUCTS

Apple
Bauxite
Corn
Cotton

Diamond
Lumber
Petroleum
Rice

RIVERS

Arkansas
Mississippi
Red

Washita
White

ARKANSAS CITY, KAN. See KANSAS (back of map).

ARKANSAS INDIANS. See INDIANS, AMERICAN (Most Important Tribes).

ARKANSAS RIVER, excepting the Missouri, the largest tributary of the Mississippi. Its drainage basin, which has an area of 180,000 square miles, includes parts of Arkansas, Texas, Oklahoma, Missouri, Kansas, Colorado, and New Mexico. Rising on the east slope of the Rocky Mountains, in the central part of Colorado, it first flows with rapid current through rocky canyons, one of which is the Royal Gorge (see below). In its upper course, much of its water is used for irrigation, and in its lower course, below Fort Smith, Ark., at high water it is navigable for small vessels. The total length of the river is about 2,100 miles; its general direction is to the southeast, though it makes one pronounced northward bend in Central Kansas. See KANSAS (Rivers).

Royal Gorge. In Central Colorado the Arkansas River cuts through one of the most beautiful canyons in North America, the Royal Gorge, famous as a magnificent example of river erosion (see EROSION). The steep sides of the canyon rise on either side to a height of 3,000 feet, extend for eight or nine miles, and in the bed the river flows tumultuously over rapids. One of the most remarkable features of the gorge is the wonderful variety of rock colors.

ARK OF THE COVENANT. See TABERNACLE; ARK.

ARKWRIGHT, ark' rite, SIR RICHARD (1732-1792), an English inventor of cotton-spinning machinery, who is rightly regarded as the founder of the modern factory system. As he was one of thirteen children of poor parents, he received little education, and at the age of thirteen was apprenticed to a barber. Having lived in a place where cotton-spinning was the chief industry, he early became interested in the processes used in cotton manufacture, and determined to better them. At that time, cloth was made with a linen warp, as no way had been found to spin cotton fit for a warp, but Arkwright invented a spinning frame that drew out the cotton from the carding machine into fine, hard-twisted thread, suitable for warp. This was an improvement upon the spinning jenny, which had been devised by James Hargreaves.

His first machine was set up at Preston, but he was forced to leave there because of the rage of the workmen against a machine which they thought would take their work from them, and he moved to Nottingham, where he became associated in partnership with two men who helped him secure a patent for his invention. In 1769 he set up his first mill, and later built a larger factory. Manufacturers tried to deprive him of his patents, and angry workmen destroyed his mills, but in the end he was entirely successful. *John*



Photo: Brown Bros.

RICHARD ARKWRIGHT

Halifax gives an excellent account of the opposition which the introduction of machinery stirred up in England. See SPINNING; FACTORY AND FACTORY SYSTEM.

AR'LEN, MICHAEL (pen name for DIKRAN KUYUMJIAN), an Armenian novelist and short-story writer. He was born in a village on the Danube River, but has spent most of his life in England. He attended Oxford University, and then journeyed to the continent, as he declared, in order to get an education.

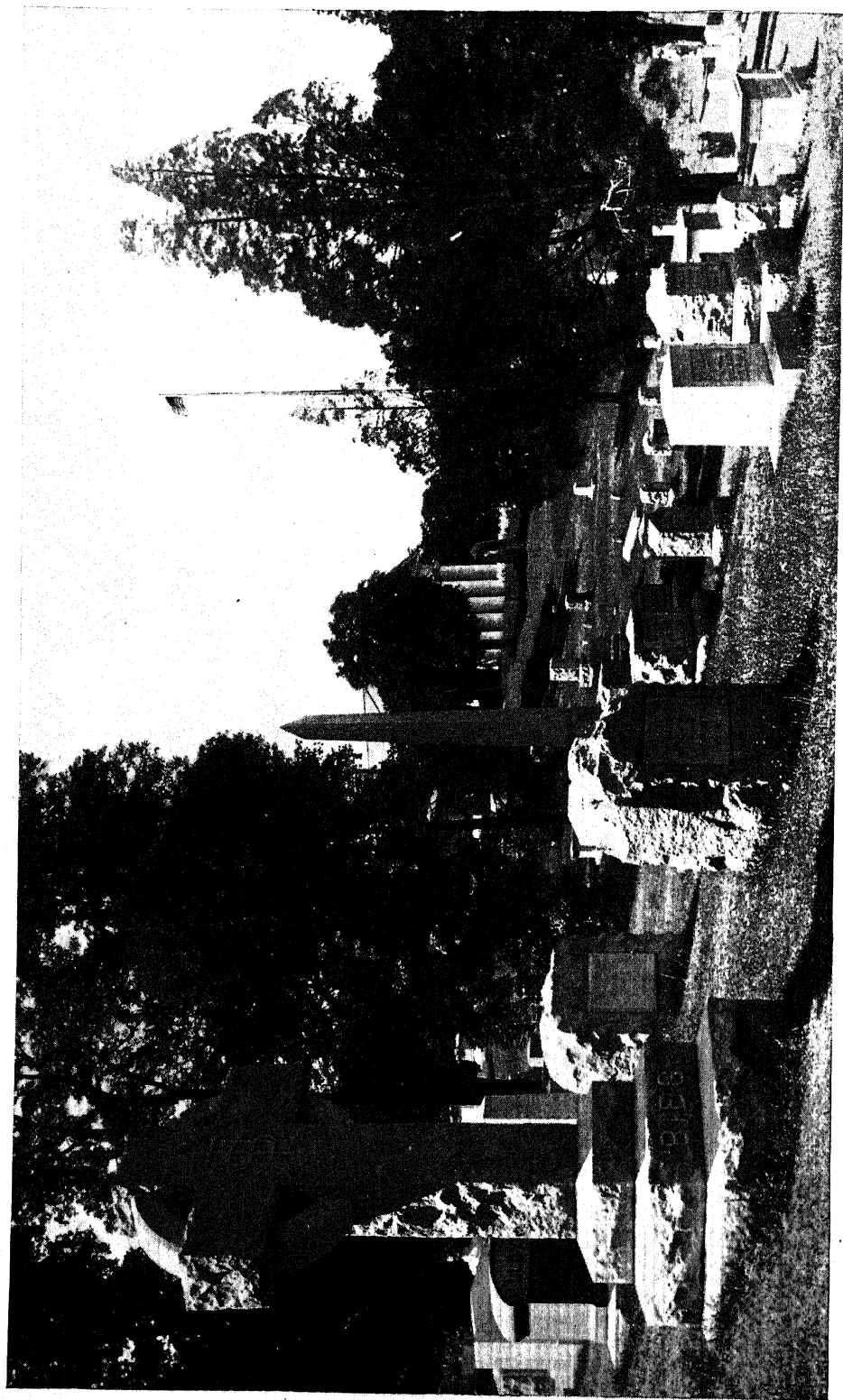
Arlen's style is artificial, but vivacious. His characters are fashionables, fluttering through an atmosphere of restaurants and smart resorts. "These charming people" are forever seeking pleasure, without being pleased. For the most part, they have few convictions, no religion, no purpose in life. They overeat, overdrink, and talk brilliantly and epigrammatically.

Arlen's prolific output from 1920 to 1925 taxed his originality, with the result that he gives the effect of plagiarizing himself.

His Published Works. In 1920 appeared his first book, *The London Venture*, which critics attributed to George Moore on a literary holiday. The most popular book has been *The Green Hat*, which was dramatized in 1925, included in *The Best Plays of 1925-1926*, and adapted for moving pictures in 1928. Other books are *The Romantic Lady*, *Piracy*, *These Charming People*, *Mayfair*, and *Young Men In Love*.

ARLINGTON, MASS. See MASSACHUSETTS (back of map).

ARLINGTON NATIONAL CEMETERY, one of the most beautiful places of burial in the United States, at Arlington, Va., within view of the city of Washington. About 18,500 soldiers and sailors of the War of Secession and the Spanish-American War, including many of high military rank, lie in graves surrounding the fine colonial mansion which was once Robert E. Lee's home, but which was seized by Federal troops during the War of Secession. In 1921 the nation dedicated here

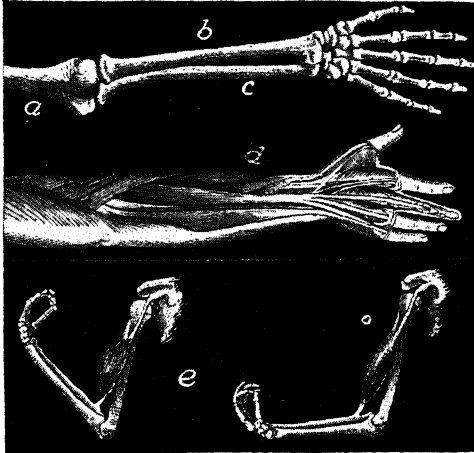


A CORNER OF ARLINGTON, WITH THE LEE MANSION IN THE BACKGROUND
 On fame's eternal camping-ground
 And glory guards, with solemn round,
 Their silent tents are spread;
 The bivouac of the dead.—O'HARA: *Bivouac of the Dead*.

a memorial "To the Unknown Soldier," whose body was returned to America from a French cemetery after the World War. The burial and dedication occurred on Armistice Day.

The Unknown Soldier. In these volumes, in the article UNKNOWN SOLDIER, will be found information bearing not only upon the American memorial, but also describing like memorials in England, France, Belgium, and Italy.

ARM, the term generally applied to the upper limbs of the human body. Strictly



BONES AND MUSCLES OF THE ARM

(a) humerus; (b) radius; (c) ulna; (d) muscles of the arm; (e) the muscles of flexion and extension.

speaking, the arm is the part that extends from shoulder to elbow, the portion from the elbow to the wrist being called the *forearm*. This distinction, however, is not usually observed, and when the arm is spoken of, the entire upper limb above the hand is meant.

The arms in man, not being needed for walking, as in the case of many animals, have been developed for a number of higher uses. Though used by primitive man only for climbing, seizing food, preparing it for use, and conveying it to the mouth, and for purposes of attack and defense, the advance of science and invention has vastly broadened their usefulness. The arms are also employed as a mode of expression, as seen in shrugging the shoulders, in the various movements and positions assumed in talking, and in the art of writing.

The movements of the arm are accomplished by sets or groups of muscles, the *flexors* bending the arm, the *extensors* extending it, the *pronators* turning the forearm over (palm downward), and the *supinators* turning it back again. The flexors and extensors move and control certain motions of the hand and fingers. The muscles (*biceps*) of the upper arm bend it to an angle at the elbow, and the

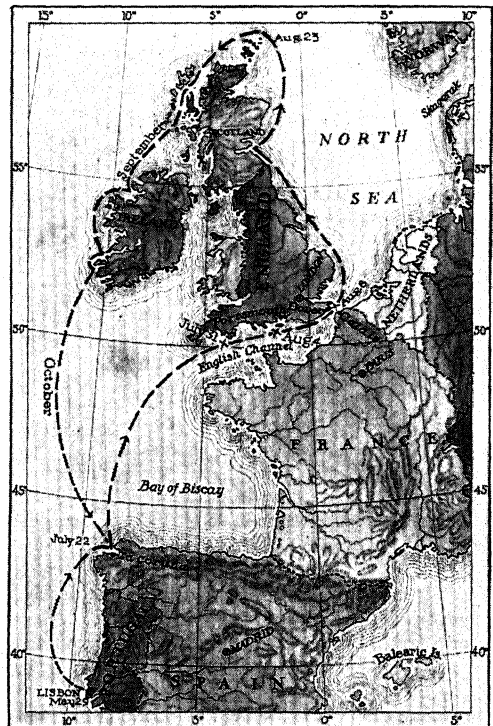
triceps straighten it out again. Then, too, attached to the upper part of the upper-arm bone are great muscles (*pectoral*) which draw the arms toward the chest wall; another great muscular mass draws the arms backward, and there is also a muscle (*deltoid*, or shoulder muscle) which raises the arm above the head. Including the twenty-seven bones of the hand, there are thirty bones in each arm. Those above the hand are the long bone of the upper arm, called the *humerus*, and the *ulna* and *radius* of the forearm.

K.A.E.

Related Subjects. The reader is referred in these volumes to the following articles:

Biceps	Muscles
Hand	Skeleton
Joints	Tendons

ARMADA, ahr ma' dah. Though this word may refer to any fleet of armed ships, it has a special historical significance, because it was the defeat of an "Invincible Armada," in 1588, that brought to an end the naval supremacy of Spain. Philip II, ruler of that country, was anxious to humble England,



ROUTE OF THE ARMADA

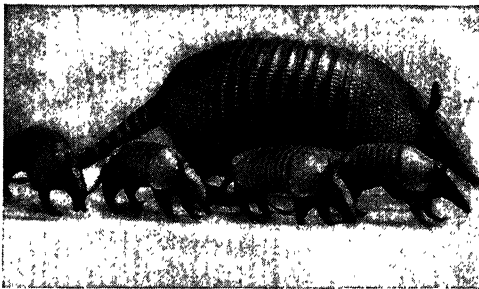
The fleet that was hailed as invincible suffered one of the most disastrous defeats ever recorded in naval history.

partly because Queen Elizabeth and her subjects had refused to acknowledge his authority after the death of the English Queen Mary,

whom he married in 1554, and partly from a desire to avenge the execution of Mary Queen of Scots (see MARY STUART). It seemed to Philip that he was indeed sending forth an "invincible" armada when the great fleet of 131 war vessels, with its 19,000 soldiers and 8,000 sailors, sailed from Lisbon harbor on May 29. But scarcely had the ships reached the open sea when they were struck by a storm, and damaged so badly that the whole fleet had to return to Lisbon for repairs.

Somewhat reduced in number, the Spanish vessels set forth again and reached the English Channel on July 30, where for a week they were harassed by the gun fire of the lighter English craft, under Lord Howard. On August 8, an English fleet under Drake drove the lumbering Spanish galleons close to the French port of Gravelines, where the commander of the armada, the Duke of Medina Sidonia, admitted defeat and gave the order to return home. The luckless fleet started for Spain by way of the Orkneys, north of Scotland. Battered by storm after storm, the armada reached home with but fifty vessels intact. The hulks of the remainder were strewn along the ocean floor—in the Channel, off the cliffs of Norway and the coast of Scotland, and out in the open sea. See SPAIN.

ARMADILLO, *ahr ma dil' o*, a South American mammal whose body is protected by bony plates. It is a harmless creature, and



ARMADILLO GROUP

The mother and her four little ones did not suspect that they were posed almost perfectly for a photograph.

lies burrowed in the earth throughout the day, moving about only in the dark hours. When alarmed, it curls itself into a ball, protected on all sides by its hard, bony shell, and rolls away from its enemy. In some species, the armor forms two large bands about the shoulders and haunches, separated by the narrow and flexible bands; in others, it is composed of a large number of small plates.

Armadillos vary in length from three feet to only five inches. As a rule, they feed on fruits and roots, but they will eat anything, and some have a liking for carrion. They frequently eat ants, and are sometimes called

ant-eaters, though differing from the true animal of that name described in its proper place in this work (see EDENTATA; ANT-EATER). Their flesh is considered palatable, and they are also killed for their armor, which is made into baskets and ornaments. The nine-banded armadillo gives birth to four young at a time. These all develop from one egg, and hence are true identical twins. L.H.

Scientific Names. Armadillos belong to the family *Dasyppodidae*. Typical species include the three-banded, or *apar*, *Tolypeutes tricinctus*; and the nine-banded, *Dasyus novemcinctus texanus*.

ARMAGEDDON, *ahr ma ged' on*, a name given in the Bible to the place in which the final great battle is to be fought on the Judgment Day between the forces of good and evil (see *Rev.* xiv, 16). Figuratively, it was applied to any spot where a decisive conflict occurred, but it had no general popular significance until used by Theodore Roosevelt during the Presidential campaign of 1912. His declaration, "We stand at Armageddon, and we battle for the Lord," rescued the word from the partial oblivion into which it had fallen.

There is an actual Armageddon, however, which was the scene of many battles of Bible times. It figured also in the World War, and later commanded the attention of archaeologists. It is a mountain district in Central Palestine, separated from the town of Nazareth by the Plain of Esdraelon. On a ridge in Armageddon, ten miles from Nazareth, the British under General Allenby defeated the Turks in 1917, and paved the way for the capture of Jerusalem. On the same ridge, an archeological expedition, financed by John D. Rockefeller, Jr., began excavations late in 1924 to secure data on the ancient civilizations that made the history of Armageddon.

ARMAMENTS, LIMITATION OF, in modern usage, refers to the gradual reduction of the naval and military equipment of nations by international agreement—particularly of the former. It does not imply a complete disarmament, but aims at limiting armaments when they exceed the necessary police and protective strength of a nation.

Although men have long dreamed of a warless world, comparatively little has been accomplished in that direction. The agreement of 1817 between Canada and the United States, limiting the naval forces on the Great Lakes and eliminating military forces on that long frontier, is one of the most famous examples of practical disarmament between two countries. The First and Second Hague Conferences urged disarmament among the nations, but without success.

After the terrible waste of the World War, the movement was given a new impetus. The principle of disarmament was one of the points

emphasized by President Wilson at the close of the war, and it is embodied in Article Eight of the Constitution of the League of Nations. Efforts on the part of the Council and Assembly of the League to put Article Eight into effect have had no direct results; it has become evident that the question of limitation of armaments, particularly land forces, is a difficult one, involving technical and political problems which cannot be settled speedily.

The Washington Conference on Naval Limitation and Far Eastern and Pacific Questions, held in 1921, was responsible for the first effective plan of naval disarmament. At this conference, Great Britain, Japan, France, Italy, and the United States signed what is known as the "5-5-3" agreement in regard to battleships, or first-line defense. This determined the number of capital ships to be retained by each country, and set the ratio of replacement at 525,000 tons for the United States and Great Britain, 315,000 tons for Japan, and 175,000 tons each for France and Italy. The problem of limitation of land armaments was considered, but so many difficulties were met that it was abandoned; a treaty in regard to the use of submarines and poison gas failed of unanimous ratification by the signatory nations.

The treaty of 1921 did not affect auxiliary craft, except to limit cruisers to a minimum of 10,000 tons. It became evident that a naval race in the building of smaller cruisers was possible, if not inevitable, and in 1927 the United States invited the five powers of the Washington Conference to a summer meeting at Geneva. Only Great Britain, Japan, and the United States were officially represented. Here the United States proposed that the 5-5-3 agreement be extended to include cruisers and other auxiliary craft. Great Britain's unwillingness to accept this plan, and the reluctance of the United States to accept a British solution, resulted in a deadlock which, after forty-five days, caused the conference to adjourn without an agreement. Japan was anxious only to prevent further naval competition and the taxation it would require.

Each conference for the purpose of disarmament, even when unsuccessful, helps to continue interest in the hope of future peace. Also, each attempt at an agreement has shown that the condition necessary in each nation before disarmament is possible is security from aggression; this, it is seen, can only be accomplished by an international outlawry of war.

ARMATURE, *ahr' ma ture*, that part of a generating dynamo or electric motor which carries electric conductors and is placed between the poles of a field magnet. The armature is usually a core of soft iron wound with insulated wires. In case of the generating

dynamo, the armature is revolved through the magnetic field of the magnet, or the magnet is moved past the stationary coils. In either case, an electromotive force is generated in the wires by electromagnetic induction. In the motor, an electric current is passed through the wires, and motion is produced by the mutual magnetic force between the armature and field magnet. H.S.E.

Related Subjects. See DYNAMO and ELECTRIC MOTOR, for detailed description of the practical armature. The various parts of the armature are shown in the full-page illustration accompanying DYNAMO.

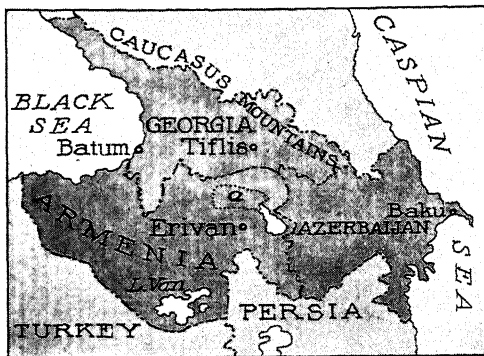
ARMENIA, *ahr me' ne ah*, a name which identifies not only the present Socialist Soviet Republic of Armenia, but a nation whose people have suffered the bitterest and most extended persecution ever known. Though scattered through more than a dozen countries, the Armenians look toward this little republic as the center of their national aspirations. It lies directly east of the devastated Turkish provinces of Eastern Anatolia. With the republics of Georgia and Azerbaijan to the north and east, Armenia forms the Federation of the Socialist Soviet Republics of Transcaucasia, which in turn is a member of the Russian Soviet Union.

The area of Armenia is 11,680 square miles, less than that of Maryland, and its population is about 860,000. More than eighty-five per cent are Armenians, and about ten per cent are Turko-Tatars.

People and Cities. The Armenians are chiefly of Aryan origin, with early intermixtures of Semitic and Mongolian stock, which have left their mark in the varying physical features of the people. In general, they are dark-skinned, with black hair and large noses. The peasants are ignorant and superstitious, but the upper classes are keen and intelligent; they have achieved considerable importance in Turkish commerce, and have reached high positions in other countries. Like the Jews, in two particulars, they are essentially an Oriental people, and have preserved their national spirit and their religion, in spite of centuries of misery and oppression from their Moslem neighbors.

The necessity of unremitting toil for the barest of living, in addition to the turmoil of their national life, has kept Armenians in the past ignorant and illiterate. The aim of the present government is to provide a free grammar-school education for all children. There are more than 81,000 pupils in schools; there are trade technical schools, also called "labor colleges," a musical academy, and a state university. The schools established by the American Near East Relief, in coöperation with the government, are educating 10,000 orphaned children and are a force for progress in education.

Only a little over fifteen per cent of the people live in towns, and there are no large cities. Erivan, the capital, is an inland city of about 90,000 people. Leninakan (formerly called Alexandropol) was the largest and most progressive city until an earthquake in 1926 destroyed more than half of it, with forty surrounding villages. Both cities, with the help of American physicians and hospitals, are improving sanitary conditions and laying



ARMENIA AND ITS NEIGHBORS

The most unfortunate Christian community in the world. The boundary of the Armenia of former days in many respects coincides with the above. The country was once a little larger.

plans for an extensive public-health system, using nurses trained in the Near East Relief schools.

Land and Resources. Armenia is a country of high mountains surrounding large valleys. There are many mountain rivers; the largest river of the country is the Aras, in the south. Lake Gokcha lies in the north-central part of the republic.

The country is suited chiefly to agricultural and pastoral pursuits, and since the forming of the republic, most of the inhabitants, as well as 400,000 refugees from Turkey, have been settled on the land. With the help of the government supplies of seed and tools, crops have reached pre-war production. About eighty-five per cent of the cultivated land is under grain, while the rest grows commercial products, such as cotton and tobacco. Olives, figs, and dates grow in the south, while non-tropical fruits grow farther north.

The country suffers from lack of rainfall, but irrigation projects are greatly increasing the arable land. Since 1921, nearly 200 miles of irrigation works have been restored or constructed.

The introduction of pure-bred cattle from Switzerland, Holland, and Russia and the work of government experiment stations are encouraging the dairy industry.

Armenia has not been an industrial country, but there are now nearly 1,500 enterprises in

the Armenian towns; many of them are wine, alcohol, and cognac factories, under the governmental monopoly of this manufacture; several leather factories are also important. The country has no coal mines, but it is beginning, in a number of recently established plants, to use the water power of the many swift rivers. The mineral wealth is chiefly in copper; large deposits are found at Ghapan and Allaverdi.

History. The present republic of Armenia includes only what was formerly known as Russian Armenia, for the country, before the World War, was divided between Russia, Persia, and Turkey, with Turkey holding the largest portion. It is an ancient land, and has long figured in the world's story. The Bible gives the resting place of the Ark as "the mountains of Ararat," which was the ancient name for Armenia, and tradition names Noah's great-grandson Haig as the founder of the Armenian race, whose members call themselves *Haiks*. The country was subject to the Assyrians and Medes, then freed itself, but was reconquered by Alexander the Great in 325 B.C.

A later revolt divided it into Armenia Major, east of the Euphrates, and Armenia Minor, west of that river. Armenia Major was long under the rule of the Parthian prince, Tigranes the Great, who was finally forced to give tribute to Rome. In 387 A.D., the Persians and Byzantines divided Armenia between them.

The kingdom of Armenia arose in the eleventh century, when the Byzantine governor of Armenia Minor made himself a free ruler. Shortly before 1400, the kingdom was overthrown by the Egyptians; in 1541 it fell to the Turks. Armenia Major, meanwhile, had been in infidel hands since 636, the Arabs first conquering it, later the Mongols under Timur, then the Turks. Persia conquered it in 1472, but fifty years later the Turks won part of it back again. Russia obtained its share of Armenia in 1828, from Persia, and in 1878 took the Turkish districts of Kars and Batum.

The religion of Zoroaster was favored in Armenia until 285, when Christianity was brought by Gregory the Illuminator. The Armenian faith is often spoken of as Gregorian Christianity, and is the oldest national Christian Church.

For centuries the Armenians were mercilessly oppressed by the Mohammedan Turks and their subjects, the half-wild Kurds, and have frequently been the victims of massacres inspired by the Turkish government itself. From 1893 to 1896 at least 20,000 and perhaps 50,000 of them were slaughtered, apparently according to instructions from the sultan, the excuse being the activities of a few hundred revolutionists. At the end of that period, the threats and protests of outside nations, es-



Photos: U & U

Phases of Life in Armenia. Armenian refugees who had escaped from Turkish persecution. A youth engaged in carding cotton with a bow string. Costumes worn by the men, and a village street.

pecially Britain, France, and Russia, induced the government at Constantinople to put an end to the massacres, but during the next two decades there were many repetitions of them on a smaller scale. In 1915, during the World War, came the crowning inhumanity of all which Ottoman rulers have conceived. Claiming that the Armenians were giving help to the Russian army and that they must be removed from the scene of war, the Turks gathered all of the population which could be found, and drove them, women, children, and old men alike, into the Arabian deserts. Hundreds of thousands perished of Turkish brutality, starvation, or exhaustion—just how many will never be known. Germany and Austria alone were able to bring pressure on the Turkish authorities, but the massacre in many quarters was looked upon as a necessary military measure.

Period of the Republic. After the Russian Revolution, during the World War, Transcaucasia (which see), a section of the former Russian Empire, declared its independence of the Bolsheviks and set itself up as a republic. It later split into the three groups of Georgians, Tartars, and Armenians. The latter proclaimed their republic in 1918, with a territory made still smaller by the action of Russia in ceding the provinces of Kars, Batum, and Ardahan to Turkey.

At the Paris peace conference, President Wilson was urged to accept a mandate for a "greater Armenia," but this proposal was rejected by the United States Senate. In 1920 and 1921, attacks made by Turkey on Armenia were followed by the intervention of Soviet Russia, and the later establishment of a Soviet Armenian government. Under the Armenian Communist party, this government still exists; its status is given earlier in this article.

Armenians are scattered through other countries—100,000 in Constantinople, 80,000 in Syria, 100,000 in Greece and the Balkans—most of them refugees in destitute circumstances. Smaller groups are in the United States, Persia, France, Egypt, and other European and Asiatic countries.

In 1925 the League of Nations decided to arrange a loan to the present Armenian government for the irrigation and drainage of land and the repatriation of Armenian refugees in Greece, Constantinople, and Syria. So far, little has been accomplished. See TRANS-Caucasian Socialist Soviet Republic.

ARMISTICE DAY, the date on which actual fighting ceased in the World War, so significant to mankind that the day, November 11, has been made a national holiday throughout the British Commonwealth of Nations, France, and the United States. In France the name Capitulation Day has been adopted.

On that day in 1922, France erected a permanent memorial on the spot where terms of the victors were forced upon the defeated Germans. The stone bears this inscription:

Here, on the 11th of November, 1918, succumbed the criminal pride of the German Empire, vanquished by the free peoples it sought to enslave.

ARMOR, *ahr' mur*, defensive covering to protect the wearer in battle. Such articles are of very ancient origin, though the earliest defensive armor consisted only of a shield with which to ward off blows from club, sword, arrows, or spears. In time, the need for greater protection was felt, and the shield was supplemented by coverings for the most exposed parts of the body. Leather and cloth were first used, but eventually they gave place to metal. Helmets to protect the head were early adopted; then came breastplates, and later, coverings for the arms and legs.

The shield and armor varied greatly, according to the fancy or requirements of the different nations adopting them. The Romans had two shields: one, large and oblong, was carried by the heavily armed legionaries to protect the body; the other, small and round, was carried by mounted troops and lightly armed footmen. The Roman helmet was small, with a neck guard and two pieces fastening under the chin. The Greek helmet was large, with a lofty crest; the shield was large in the Homeric era, but considerably smaller later. Both Greeks and Romans wore greaves, jointed pieces of armor, on legs and arms, though the Romans usually wore them on the right leg only, the shield being relied on to protect the left leg.

In the days of the Crusades, knights were covered with armor from head to foot, even the hands being protected by armored gauntlets. The armor was made of plates of metal, or of metal rings linked together and worn over a leather tunic. The helmet had a visor, or covering for the face, and when in full armor a knight was quite unrecognizable. This led to the introduction of armorial devices and bearings worn on the shield for purposes of identification. The making of armor developed into a high art, and the metal was so well forged that the wearer was fully protected from arrows, spears, and sword thrusts, except at the joints of the armor.

After the introduction of gunpowder the use of armor gradually decreased, though noted armorers still provided armor which could not be penetrated by a musket ball. The helmet still survives in some modern armies, particularly with the Germans, and reached its highest development in the World War. Against modern rifle bullets, however, and the high-powered explosives now used by all countries, such armor is practically useless as a protection.



DEVELOPMENT OF ARMOR

(a) The equipment of a warrior in the Stone Age; (b) a German soldier of the third and fourth centuries; (c) warrior of ancient Greece; (d) Roman soldier; (e) German in full armor at time of Maximilian I; (f) soldier of Western Europe in early seventeenth century; (g) French soldier of the eighteenth and the early nineteenth centuries, the last type of armor-clad fighting men.

ARMORIAL, *ahr mo' ri al*, **BEARINGS**. See **HERALDRY**.

ARMOUR, PHILIP DANFORTH (1832-1901), a noted American merchant and philanthropist, one of the founders, and for forty-one years the head, of Armour & Company, Chicago, the largest pork-packing and dressed-meat establishment in the world. He was born at Stockbridge, N. Y., and in 1852 went to California, where he spent four years without marked success. In 1856 he engaged in the wholesale-grocery and grain-commission business in Milwaukee, Wis., and a few years later joined his brother, Herman O. Armour (1837-1901), and others in the pork-packing business under the name Armour, Plankinton & Co. After 1870, this firm was known as Armour & Company, and rapidly became the greatest of its kind, with branches in all parts of the world. Armour had many interests outside his business, and donated large sums to philanthropic projects. He founded Armour Institute of Technology, which is established in the industrial district of Chicago.

Upon his death, his interests were entrusted to his son, J. Ogden Armour (1863-1927). After the World War, the wealth of the latter

was estimated at about \$130,000,000, but in the deflation period which followed, and partly owing to investments which he could not turn quickly, he lost the greater part of his fortune. He died while on a business trip to London.

ARMSTRONG, SAMUEL CHAPMAN (1839-1893), the founder of Hampton Normal and Agricultural Institute (which see) and the man who did much to define the educational policy for negroes and Indians in America. He was a son of an American missionary, and was educated at Oahu College, Honolulu, and Williams College, Massachusetts. He entered the Union army in 1861, and was mustered out with the rank of brigadier general of volunteers.

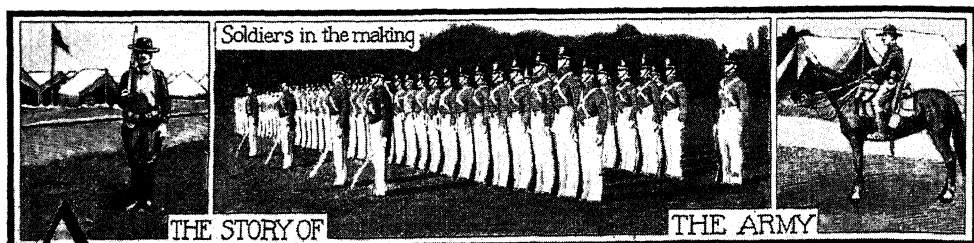
After the war, he was associated with General O. O. Howard in the Freedmen's Bureau, and during the two years in which he was engaged in this work matured a careful plan for educating negroes. He then founded the Hampton school, and to its work gave the remainder of his life.

ARMSTRONG, WILLIAM GEORGE. See **ARMSTRONG GUN**.

ARMSTRONG GUN. Modern artillery dates from about 1855, when William George Armstrong, in England, devised a weapon

which did not use a round ball such as had always been employed in cannon, but an elongated and pointed projectile, which was fired from an entirely new sort of gun barrel; this barrel was built up of rings of metal shrunk upon an inner steel barrel. The gun was loaded at the breech. Armstrong's invention has been superseded by vastly more efficient weapons, but these are all based on the principles put forward by him, and he will never be denied the credit which is due him.

Lord William George Armstrong (1801-1900), the inventor of the gun described above, was an English mechanical engineer, whose interest in scientific work had lured him from the study of law. The hydro-electric machine and the hydraulic crane were among his earlier inventions, and in 1854 he gave to the science of warfare the rifled gun. On presenting his patents to the British government, he was knighted by Queen Victoria and appointed engineer of rifled ordnance. The universities of Cambridge and Oxford conferred honorary degrees upon him, and in 1887 he was made a peer.



ARMY, a term applied to a large body of men organized, trained, disciplined, and armed for military service on land, and placed at the disposal of a nation for that purpose. From time immemorial, armies have been employed as aggressive forces—to storm enemy positions, to overthrow cities, to overrun nations by the irresistible force of numbers, as well as to hold what they have captured.

These basic facts were just as true at so recent a time as the World War as they were in the days of Alexander, Caesar, or Napoleon, though new weapons of unprecedented value, such as the most deadly gases, tanks (which were all but motorized fortresses), and aircraft were introduced into this modern conflict.

Eminent military men are of the opinion that the old traditions of armies will not be revived in the next great war, whenever it comes or wherever it may be fought. Cities will be destroyed or captured by fleets of aircraft so numerous as to darken the skies, and only after such reduction will the army be brought forward, to hold what these new war machines have taken. This is prophecy, indeed, but it appears to have a basis of reason.

Development of the Modern Army. Though huge hosts of fighting men were gathered in ancient times, the modern army is an outgrowth of the fourteenth-century "free companies," which were men organized under definitely appointed leaders for the purpose of improving the art, or "handicraft," of war, and of making their own services more valuable. These free companies hired themselves out to fight for those who were willing to pay for their help. Their members became most efficient fighters, and therefore were in great demand. But with them war was merely a trade. There was no patriotism in their fighting, no desire for per-

sonal distinction, no spirit of emulation. Soldiers were simply members of a well-organized labor union, fighting for pay; they lacked love of country or conviction of the justice of the cause for which they fought. Such a group were the Hessians hired by England to fight the American colonists in the Revolutionary War. It is of interest to note, however, in this connection, that some of these Hessians remained in America after the war and became citizens of the new nation, and that their descendants are to-day among the sturdiest and most loyal supporters of the government. Gradually came the end of the employment of the free companies, as soldiers fighting for hearth and home proved superior to mere war mechanics. But the methods by which the free companies had brought their fighting powers to a high state of efficiency have been retained and adapted by military authorities to meet modern requirements.

The modern conception of the army as "the nation in arms," as distinguished from a body of professional soldiers, dates from the French Revolution (1793). It was then demonstrated that the mass of the citizens, moved by patriotism, is more effective than professional troops. To-day the military organizations of all the nations are based upon this notion.

An army organization is the most efficient organization the world knows, with the possible exception of a navy of the first class. When civilians proved unequal to the titanic task of building the Panama Canal, the army of the United States was called in, and rapidly and successfully completed that work. In the World War, which began in 1914, the thoroughness of military methods was even more effectively demonstrated in handling foodstuffs, building railroads, and organizing the people

of a nation in their agriculture and manufactures. It is, in fact, because of this very efficiency, gained at the expense of individual freedom, that militarism is opposed, for it is assumed to threaten the independence of the people.

The principle of army organization is that each man is responsible to a superior in everything, and that he must obey absolutely, no matter what the command. Tennyson gave this truth striking emphasis in *The Charge of the Light Brigade*, wherein are the lines—

"Forward, the Light Brigade!"
Was there a man dismayed?
Not though the soldier knew
Some one had blunder'd;
Theirs not to make reply,
Theirs not to reason why,
Theirs but to do and die;
Into the valley of Death
Rode the six hundred.

Though all men are born equal, they cease to be so when they enter the army. Even officers of the same rank are graded, generally according to the length of their service.

Spirit. In war times more than in peace the effectiveness of an army depends upon *morale*, the spirit of its men, and upon *esprit-de-corps*, which means loyalty of the men to the organization. For this reason, the volunteer system is believed by English, Canadians, and Americans to produce a better body of fighting men than enforced service, for volunteers fight to win a cause and not merely to obey their superior officers.

Grades of Soldiers. But even in volunteer armies there is a vast difference in the degree of democracy believed to be productive of the highest discipline. There are ordinarily three grades of soldiers, commonly spoken of as *Officers*, *N.C.O.'s*, and *Men*. The officers are more correctly termed *commissioned officers*, and include all between the ranks of general or field marshal and lieutenants; they are appointed, or commissioned, by the government. *N.C.O.* means *non-commissioned officer*, a sergeant or corporal, whose appointment comes only from his own regiment. *Men* refers to privates, who have no authority except, for instance, as they are temporarily made sentries. British army officers never meet *N.C.O.'s* as equals, even when off duty. For one to eat with the other or to join him in amusements is considered destructive of discipline. In the militia of the United States, the other extreme is reached, and the officers, though receiving their commissions from the government, are often elected by those whom they are to command. Canadian troops in theory follow the English idea of the social separation of officers, but in practice are democratic. That their indifference to discipline while off duty did not adversely affect their *esprit-de-corps* in the des-

perate fighting of the World War is well known.

Supplies. In modern warfare the effectiveness of an army often depends more on its organization than on the bravery of its mem-



Photos: U & U

MEDALS OF HONOR AND MERIT

Two medals awarded by the army of the United States for distinguished service and recognition of merit. A-B, obverse and reverse of medal of merit; C-D, obverse and reverse of distinguished service medal. [In these volumes, see CONGRESSIONAL MEDALS OF HONOR.]

bers. Troops must be quickly transported to their stations, and must have a supply of arms and ammunition at all times, and in trench warfare food and sanitation win more battles than do bullets and shells. During the World War, hot meals were served to the soldiers in the trenches, even during the progress of violent battles, for it was found that each man did his work with more zeal if his hardships were lessened. In the Serbian campaigns, cleanliness would have been more valuable at times than reinforcements in men or munitions.

The Parts of an Army. An army is made up of units within a unit. A mob may be organized to the extent that it will follow a leader, but its effectiveness disappears when it is divided. An army, on the other hand, can be separated into any number of parts to accom-

plish the work in hand. Most of the military forces of the world are nearly alike in formation, the principal differences being in the names of the units and of the officers commanding them, and in the number of men within each unit. The three main *arms* of the service are the infantry, cavalry, and artillery. The engineers, aviators, signal corps, ambulance corps, and others are no less important, but are smaller in number.

The variety of weapons used, and the limited function of each kind, renders advisable this division into *arms*.

A nation may have several armies, each re-

sponsible, through its commander, only to the commander in chief of all the forces. An army, in this technical sense, is composed of two or more *army corps*, aggregations of from 30,000 to 35,000 men each, and each *corps* is in turn made up of *divisions*. The division is the smallest body normally containing two or more arms of the service, and its make-up varies according to its description, as an *infantry division* or a *cavalry division*. In the United States and Great Britain, the following plans of organization prevail, but it must be noted that these are always subject to needed modifications:

TACTICAL, OR INFANTRY, DIVISION

Great Britain
3 brigades (each 4 battalions)
1 squadron
4 brigades, 1 heavy battery
2 companies
1 company
1 squadron
1 column
1 train
3 ambulances
598 officers, 18,075 other men,
6,161 horses, 76 guns.

Infantry
Cavalry
Field Artillery
Engineers
Signal
Aero
Ammunition
Supply
Engineer
Sanitary

United States

3 brigades
1 regiment
1 brigade
1 regiment
1 field battalion
1 squadron
1 train
1 train
1 train
1 train (4 ambulance companies, 3 field-hospital companies).

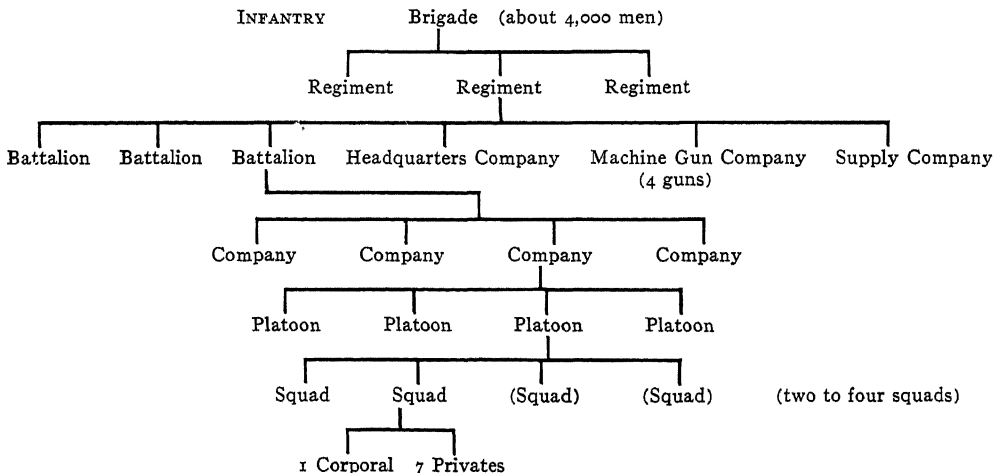
TYPICAL CAVALRY DIVISION

4 brigades
2 brigades
4 troops
1 squadron
1 squadron
1 cavalry train
4 ambulances
486 officers, 9,410 other men,
10,195 horses, 24 guns.

Cavalry
Horse Artillery
Engineers, mounted
Signal, mounted
Aero
Ammunition
Supply
Engineer
Sanitary

3 brigades
1 regiment
1 battalion
1 field battalion
1 squadron
1 train
1 train
1 train
1 train

A *brigade* is the largest unit of any one arm. In the United States it is made up as follows:



The number of men in a company may be changed at the discretion of the President of the United States. The number has ranged in recent years from 100 to 250.

Similar divisions apply to the cavalry and artillery branches of the military service.

Officers. Army officers are of two types, *commanding* (line) officers and *staff* officers. The latter are the assistants to the commander of a regiment or any larger unit.

In the United States, the President is commander in chief of the armed forces. There are several grades of *general officers*, namely, generals, lieutenant generals, major generals, brigadier generals, and the various members of the General Staff, such as the quartermaster general, the adjutant general, and the paymaster general. In times of peace, the grades of general and lieutenant general are often allowed to lapse. In war time, a general would probably command an army, a lieutenant general an army corps, a major general a division, and a brigadier general a brigade. In Great Britain the highest officer is the field marshal.

The commander of a regiment is a colonel. In the United States a battalion is under the charge of a major; in Great Britain, where the battalion contains twice as many companies, it is assigned to a lieutenant colonel. A captain commands a company, assisted by two lieuten-

ants. A squadron of cavalry is given to a major, and a troop to a captain. A battery is a captain's command in the United States army, a major's in the British. The lieutenant colonel in the United States army is merely an assistant to the colonel; in the British, he practically replaces the latter in the handling of matters of detail.

Corporals march in the ranks with the privates. Sergeants are posted as guides and in the line of file-closers in rear of the company. The first sergeant has special duties, as have also the mess sergeant and supply sergeant. The color sergeants, battalion and regimental sergeants major are members of the regimental headquarters company. A lance corporal is a corporal whose appointment is not yet made permanent.

An adjutant (which in Latin means *one who aids*) is an assistant to the commander of a regiment, and usually holds the rank of captain or lieutenant. An *aid* or *aid-de-camp* is a general's assistant, and he may have the rank of lieutenant or colonel.

Armies of the World

United States. The United States army has always been small, in comparison with European armies, and military service has, except during the Civil and World wars, been voluntary and based on the principle that "one volunteer is worth three pressed men." In 1790 the rank and file of the army consisted of 1,216 men. In 1861, at the beginning of the War of Secession, it totaled about 15,000. Between 1861 and 1865, however, nearly 4,000,000 men were enrolled in the contending armies of the North and South. These figures eclipsed those relating to any previous war and opened wide the eyes of the world to what could be accomplished by a peace-loving nation without a definite military system, if thrown into war. During that war, however, the total of the authorized regular army never exceeded 40,000 men, the remainder being special volunteers who returned to civil life as soon as their services were no longer required.

This practice has always been followed. In time of war, the small regular army forms the nucleus of a large volunteer army created for the particular emergency. The maximum war strength of the United States army in the Spanish-American War was 10,017 officers and 213,218 enlisted men, and in the World War there were enlisted over 4,000,000 officers and men.

Before the passage of the Chamberlain-Hay Bill, approved by the President in June, 1916, the regular army of the United States was less than 100,000 men. Of these, two-thirds were assigned to coast defenses, island possessions, recruiting points, and other permanent posts, so

that slightly more than 30,000 were *mobile* troops. To them could have been added in time of war 127,000 men and officers of the militia.

The new bill increased the authorized regular army to a total enlisted force of the line of 175,000, and an aggregate of officers and men, line and staff corps, of approximately 225,000. The strength of the militia was made 425,000; its members were required to take an oath of allegiance to the national as well as to their individual state governments. By enlistments, the regular army by the beginning of 1918 possessed about 300,000 officers and men. The National Guard, after the declaration of war upon Germany, was immediately mobilized, increasing America's potential fighting force to over 700,000 men. The conscription act of 1917 resulted in June of that year in the enrollment of nearly 10,000,000 young men between the ages of 21 and 31, from whom a great army would in time be assembled. Physical defects and exemptions disqualified over half of this number, but 4,000,000 were placed under arms and about 2,000,000 saw service overseas.

In 1922 the new army bill of 1921 was put into effect. Refusing to be impressed with the necessity of preparedness for war, Congress had the army reduced to 125,000 men. To accomplish this, the number of infantry regiments was reduced from 65 to 45, and regimental strength from 1,490 men to 1,312 men. Proportionate cuts were made in all other branches of the service at home and abroad.

In order to supplement the reduced military establishment, various training activities are

regularly carried on. Among these are the National Guard, in which men are trained at their home stations and in summer training camps; the organized Reserves, in which officers are trained for a limited period each year; the Reserve Officers Training Corps, which provides for the training of young men in certain educational institutions; and the Citizens' Military Training Camps, which enable men in civilian life, between the ages of seventeen and thirty-one, to receive one month's training during each year for four years. These measures enable many of the men to qualify for officers' commissions, and equip with a rudimentary knowledge thousands of men who would otherwise be uninformed of this necessary part of their duty as citizens.

Congress alone has the power to vote appropriations for the maintenance of the army, and once during the life of each Congress, which is two years, the army appropriation bill is passed. In cases of emergency, a special fund is voted. The cost of the small regular army maintained before 1917 was about \$95,000,000 a year, practically \$1 for each citizen. With the entrance of the United States into the World War, the war expenditure leaped to unprecedented figures. For the fiscal year ending June 1, 1918, the total outlay of the government for all war purposes—army, navy, aircraft, munitions, and all other war efforts—was close to \$20,000,000,000. The army increased to 4,000,000 men before the fall of 1918; 2,200,000 were in France.

Canada. Because its only neighbor is the United States, with which it has maintained over one hundred years of peace, Canada does not need a large standing army.

The forces of the country are controlled by the Militia Council, of which the Minister of Militia is president. In peaceful times, they consist of a permanent militia (including artillery) of 3,500 men, and a non-permanent militia with nearly 80,000 members. The latter drills periodically and trains in camp for a short period each year, in the same manner as the National Guard of the United States. Its members are required to serve for home defense only, and all overseas contingents are specially recruited. Over 400,000 volunteers responded during the first three years of the World War. In 1917, a conscription law was passed. The annual cost of the militia before the European war was from seven to nine million dollars, or slightly over \$1 for each inhabitant of the Dominion, practically the same as for the United States.

British Army. Englishmen and Americans have never taken kindly to the idea of compulsory military service, and they object to paying for the maintenance of an army of which they do not see imperative need. The British law enacted in the Bill of Rights in 1689 expressly declares it illegal for the king

to maintain an army in time of peace without the consent of Parliament. This provision has never been revoked.

The army of Great Britain is divided into two parts, one for foreign or colonial service, the other for home defense. The territorial army, organized after the Boer War, is for the latter purpose. The term of enlistment in the *regulars* is usually twelve years—seven with the colors and five with the reserve. The age for enlistment, except in cases of national emergency, is from eighteen to twenty-five. The military establishment of Great Britain before the World War began in 1914 was as follows: regular army, 156,110; reserves, 209,914; territorials and militia, 258,437; colonial forces, 87,114; total, 711,575 men. Of this number only the regular army and the reserve were available for foreign service, except in cases where individuals or whole corps of the auxiliaries specially volunteered. However, before conscription was put into effect, over 5,000,000 men had answered their country's call between August, 1914, and January, 1916.

The total cost of the British army (exclusive of troops for India, of which the cost is borne by the Indian government) for a year of peace is £28,000,000 (about \$135,000,000), or about \$3 for each person in the kingdom. A comparison with the estimated cost of the Panama Canal shows that in three years of peace the British army in England, exclusive of its overseas forces, costs more than was needed to complete the canal, which employed over 40,000 men in peaceful labors for seven years. The administration of the army is in the hands of an army council and a Secretary of State for War.

German Army. From 1871, after the close of the Franco-German War, there was compulsory military service in the empire until its fall in 1918. Every male had to serve in the army or navy, unless mentally or physically unfit. At the beginning of the European war in 1914, it was estimated that the German Empire could raise a fighting force of 7,900,000 men, all of whom had undergone military training. The total strength of the army in peace times was 770,000. Each man was expected to serve either two or three years in the standing army, and the balance of a term of seven years in the reserves, after which he was drafted into the *landwehr* (home defense force). At the age of thirty-nine, he left the *landwehr* for the *landsturm*, where he remained until he reached the age of forty-five. The *landsturm* consisted of those available for service in an emergency, including both the graduates of the *landwehr* and the younger men who had escaped military training. Military service might be required from the age of seventeen, but actual training usually began at twenty. Sometimes the term with the standing army was reduced to one

year, in cases of men of good education and intelligence. Each army corps was recruited from a particular territory and passed its time-expired men into the *landwehr* of the same district. The peace terms of 1919 definitely limited the German army to a harmless 100,000 men.

French Army. In the year 1872, as soon as reconstruction could be effected following the disastrous Franco-German War, compulsory military service was legalized in France. The form of conscription previously in force allowed substitution; a man not desiring to serve could pay another to take his place. This led to abuses, and substitution was abolished. Under the law now in force, two years must be spent in the active army, eleven years in the reserve, seven in the territorial army corresponding to the German *landwehr*, and seven more in the territorial reserve corresponding to the German *landsturm*. It is estimated that at the outbreak of the World War, in August, 1914, the troops of France totaled 703,000, of whom 134,000 were in colonial service, many of them natives. Altogether, there were nearly 5,000,000 trained men of military age, but it is probable that considerably more than this number were placed under arms between 1914 and 1919. The French soldiers are of rather small stature, but are wiry, active, and enthusiastic. Though experts had often expressed the opinion that a French attacking force was far superior to an equal French force on the defensive, the World War proved the heroic resistance of which France is capable.

Russian Army. After the Russo-Japanese War, the Russian army became almost an unknown quantity until the outbreak of the World War. That great changes had been made and that the efficiency of the army as a whole had been raised were proved by its rapid mobilization and stubborn work in the first three years of the war.

The military system of Russia was similar to that of Germany and France, each soldier serving in various ranks, active and inactive, from his twentieth to his forty-third year. Cossacks served for life (see COSSACKS). Active soldiers at the beginning of the European war in 1914 numbered probably about 1,300,000 and the reserve 6,000,000 or more. Estimates of the number of other men available for service ranged from 5,000,000 to 10,000,000.

Russian soldiers are hard fighters, though except in a few picked regiments their standard of physique and intelligence is always low. There were severe difficulties for the nation to overcome in mobilization when the World War burst upon the nations, because of the vast area of the country and poor railroad communications. Although Russia supported the largest standing army in the world before the 1917 revolution, the burden upon the people

was never heavy, amounting to only \$1.87 per unit of population.

In 1918 the Soviet government established a "red" army of volunteers, which developed into a well-organized and well-disciplined fighting force. Universal military service is in effect, and is divided into preparatory, service with the colors, and reserve service. Men begin training at the age of nineteen. The number of men annually available for training is about 500,000. The strength of the regular army is about 562,000, but this includes both the land and sea forces. All armed forces, including the army, the navy, and the air service, are controlled by the Military Soviet of the Union; the army is under the direction of a Military Council.

Italian Army. The Italian army is also organized on the principle of universal liability to service. Italy claims war resources to the extent of 3,150,000 men, with a total permanent force in peace time of about 400,000; this number is not maintained by Mussolini.

Italian regiments are not recruited from geographical sections, but each unit receives reinforcements from all parts of the country, and the troops change their stations every four years. This plan, in direct opposition to the French and German method, is adopted so that the young men from one section of the country will make friends with those from another, thus welding together the different elements of the nation.

F.L.B.

Related Subjects. These volumes contain a large number of articles which the reader interested in military affairs will find helpful.

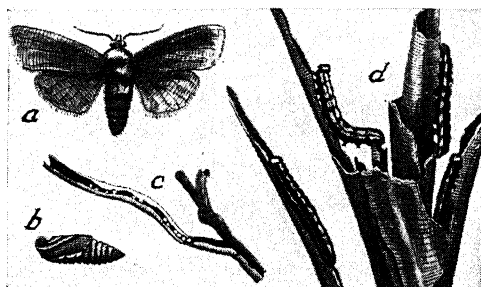
GENERAL TOPICS

Adjutant	Major
Aid-de-Camp	Marshal
Amnesty	Military Academy,
Armor	United States
Arsenal	Military Preparedness
Battalion	Military Schools
Blockade	Militia
Blockhouse	Neutrality
Brevet	Parole
Brigade	Phalanx
Bugle	Prisoners of War
Cadet	Rank in Army and Navy
Captain	Regiment
Cavalry	Reserve Officers' Train-
Congressional Medals	ing Corps
of Honor	Rough Riders
Colonel	Sergeant
Contraband	Shield
Corporal	Shogun
Court-Martial	Siege
Croix de Guerre	Signal Corps
Ensign	Signaling
Flag of Truce	Spy
Gauntlet	Squadron
Gendarmes	Staff
General Staff	Training Camps,
Grenadier	Military
Helmet	Uniform and Insignia
Hostage	Victoria Cross
Infantry	Volunteers
Iron Cross	War
Lieutenant	Zouaves
Machine Gun	

WEAPONS AND AMMUNITION

Ammunition	Gunpowder
Armstrong Gun	Howitzer
Artillery	Liquid Fire
Battering Ram	Machine Gun
Blunderbuss	Musket
Bomb	Poison Gas
Boomerang	Projectile
Bow and Arrow	Revolver
Broadsword	Rifle
Bullet	Rocket
Cannon	Shell
Cartridge	Shot
Cordite	Shotgun
Explosives	Shrapnel
Firearms	Sling
Fireball	Smokeless Powder
Gatling Gun	Sword
Greek Fire	T. N. T. (see Explosives)
Grenade	Tomahawk
Guncotton	Torpedo

ARMY WORM, the caterpillar of a night-flying moth that is especially injurious to grain and garden crops in the eastern half of the



ARMY WORM

(a) moth; (b) pupa; (c) eggs in natural position in grass leaf; (d) army worms on growing corn.

United States and Canada. It is so called because large numbers of the pests sometimes literally march across the fields like an invading army, and devour every green thing above ground.

The army worm is a hairless, fleshy caterpillar, about an inch and a half long, with green and yellow stripes. The adult moths, which are dull-brown insects, come out of the pupal cases in the spring, and the eggs are deposited in strings beneath the sheaths of grass stems. In a little over five weeks, full-grown larvae are vigorously consuming everything in sight. These caterpillars usually feed at night and remain in hiding during the day, but when numerous and short of food, will travel and feed during the day. They march off to new fields when the original field is devastated. A new generation of moths appears in the fall, and it is the larvae of these moths that devour the summer crops.

Army worms are fought with bran mash, poisoned with Paris green, which is spread over the infested areas or on the borders of fields threatened by them. Dust furrows as described for the chinch bug are also used as

barriers. The natural enemies of the caterpillars help to keep them in check. W.J.S.

Scientific Name. The moth of the army worm is classed as *Leucania unipuncta*. It belongs to the family *Noctuidae*. See *MOTH*.

ARNHEM. See *NETHERLANDS, THE (The Cities)*.

ARNICA, *ahr' ni kah*, the name of certain plants which yield a juice or a tincture known to every child because it is used on bruises to drive away the blood which collects around them. The common, or mountain, arnica is the source of the commercial product. It has a twisted root which lives from year to year, and a stem about two feet high which bears heads of golden-yellow flowers. Every part of the plant contains *arnicin*, of which the well-known medicine is made. Mountain arnica is native to Europe, and its culture is carried on



THE ARNICA PLANT

there almost exclusively, since it is difficult to raise the plant away from its natural habitat.

B.M.D.

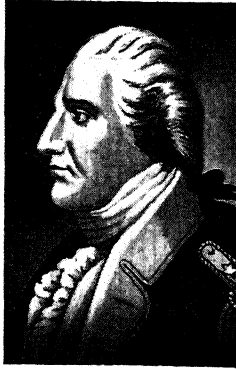
Scientific Name. Mountain arnica is a member of the family *Compositae*. Its botanical name is *Arnica montana*.

ARNICIN, *ahr' ni sin*. See *ARNICA*, above.

ARNOLD, BENEDICT (1741-1801), an American general of the Revolutionary period, long beloved and trusted, yet remembered as one who betrayed his country. After his act of treachery, those who were seeking his arrest for treason said that it would be right to "bury with high military honors the leg which was injured at Saratoga and Freeman's Farm and hang the rest of him."

Arnold was born in Norwich, Conn. He received a fair education, and in 1762 went to New Haven, where he conducted a book and drug store, and later engaged in trade with the West Indies. At the outbreak of the Revolution, he entered the army, and after the Battle of Lexington, April, 1775, he joined the expedition of Ethan Allen that captured Crown Point and Ticonderoga, though he had hoped to have command of the project himself. Later in the year, he led a force of a thousand men into Canada, and cooperated with General

Montgomery in the attack on Quebec. Arnold's leg was broken in the battle, which was an American defeat. For his courage, he was promoted to the rank of brigadier general, and in June, 1776, gave a good account of himself during a naval battle on Lake Champlain.



BENEDICT ARNOLD

Arnold was fated to endure a succession of disappointments, which proved a severe trial to a proud and sensitive nature. In 1777, five new major generals were appointed by Congress, though all of them were Arnold's juniors; even the influence of Washington did not bring about a correction of the injustice. Yielding to Washington's plea that he remain in the service, Arnold took part in the offensive against the British in Connecticut, served under Washington in the campaign against Howe, and cooperated with Schuyler in thwarting the plans of Burgoyne. In the second Battle of Saratoga (October, 1777), he displayed gallant courage and was badly wounded. Though Gates received credit for the victory, Congress voted Arnold the country's thanks and gave him, finally, his proper relative rank as major general.

In 1778 he was placed in command of Philadelphia. Having married a beautiful society girl, the daughter of a Loyalist, he subjected himself to criticism for living fashionably and beyond his means; furthermore, the executive council of Pennsylvania accused him of overstepping his authority and of showing a bias toward the Tories. A court-martial acquitted him of deliberate wrongdoing, but sentenced him to be reprimanded for injudicious conduct. Though Washington performed this unpleasant duty with real kindness, Arnold was deeply wounded by what he considered an unmerited disgrace.

Brooding over his country's ingratitude and injustice, for thus he interpreted the incidents related above, Arnold turned his thoughts toward certain overtures the enemy had made to him. In 1780, having taken command of West Point, he developed a plan to surrender the fort to the British General Clinton, with whom earlier he had been in correspondence. His treachery became known through the capture of Major André, and Arnold escaped to New York City. Subsequently, he was given a British brigadier general's commission and about \$30,000 for losses he claimed to have suffered by joining the British. He

remained in America a year, and led two British expeditions which resulted in the burning of Richmond, Va., and of New London, Conn. In England, though Arnold was kindly received by King George III, he met only public scorn. He failed to obtain a commission in the army, and spent most of his remaining years as a merchant in the West India trade. His wife, faithful through all his troubles, cheered his last days, when he was burdened with debt, discouraged, and an outcast from society. See REVOLUTIONARY WAR IN AMERICA; ANDRÉ, JOHN.

ARNOLD, SIR EDWIN (1832-1904), an English author, born at Gravesend, best known for his *Light of Asia*, a poem presenting the life and teaching of Gautama, the founder of Buddhism. While at University College, Oxford, he won the Newdigate Prize for a poem. In 1861, after teaching for five years at Poona, in Bombay, he joined the editorial staff of the *Daily Telegraph*, with which he was connected for many years. He was made a companion of the Order of the Star of India, a Knight Commander of the Order of the Indian Empire, and was decorated by the sultan of Turkey and other Oriental rulers.



SIR EDWIN ARNOLD

[His works include numerous translations from the Greek and Sanskrit and several volumes of narrative and lyric poems.]

ARNOLD, MATTHEW (1822-1888), one of the greatest of English critics, the famous son of a famous father, Thomas Arnold of Rugby. Matthew Arnold studied at Rugby while his father was head master there; he also attended the preparatory school at Winchester and received his college degree at Oxford. From 1851 until his death, he was inspector of schools, and for ten years after 1857 was professor of poetry at Oxford. He himself was a poet of high merit, though the amount of his poetry was small, and it had a limited



MATTHEW ARNOLD

appeal. As a critic, he has retained the admiration that was accorded him in his own day. He was the apostle of "sweetness and light," being convinced that in religion, politics, and education, no less than in literature, both culture and beauty are essential elements.

His Writings. Arnold's best work in poetry includes *Sohrab and Rustum*, *Balder Dead*, *Tristram and Iseult*, and the fine elegy *Thyrsis*. Among his prose writings are *Essays on Criticism, Culture and Anarchy*, *On Translating Homer*, and *Literature and Dogma*.

ARNOLD, THOMAS (1795-1842), a celebrated English scholar, clergyman, and teacher, known to almost every child as the beloved head master in Hughes's *Tom Brown's School Days*. The noted English critic, Matthew Arnold, was his son.

Thomas Arnold was born at West Cowes, Isle of Wight. Entering Oxford at the age of sixteen, he gained distinction for his scholarship and the originality of his opinions. In 1828 he began his career as head master of Rugby, and held the position until his death. So profoundly did he influence educational policies by his new methods of teaching and discipline that such English public schools as Eton, Harrow, and Winchester completely changed their systems of instruction. Arnold's personal example of rectitude in thought and life was an important factor in the influence he wielded.

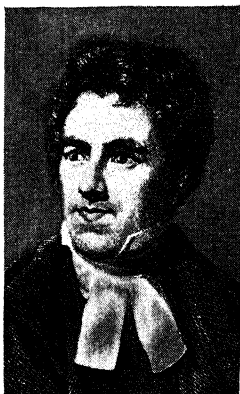


Photo: Brown Bros.

THOMAS ARNOLD

Related Subjects. See RUGBY, for a detailed account of his methods. Reference is also suggested to CHARACTER TRAINING (Unselfishness Is Fundamental).

ARNO RIVER, a famous river in Tuscany, Italy, on whose banks stand Florence and Pisa, the former fifty miles from its mouth, the latter six. Beginning in the Apennines, 4,430 feet above the sea, it rushes along a winding course of 150 miles to its mouth, north of Leghorn, on the coast of the Ligurian Sea, the arm of the Mediterranean north of Corsica. When the water is high, boats may ascend the Arno as far as Florence; in the Middle Ages, Pisa was a maritime port of the first rank. The river valley, which bears the musical name *Val d'Arno*, is one of Italy's most beautiful and fertile regions.

AROMATIC, *air o mat' ik*, **PLANTS.** An aromatic plant is one with a fragrant smell

and warm, pungent taste. For further details, see SPICE.

AROOSTOOK WAR, *air roos' took*. See VAN BUREN, MARTIN (Administration).

ARRACK, *air' ak*. See RICE (Other Uses); COCONUT; PALM.

ARRAIGNMENT, *air ain' ment*, the act of bringing a person who has been indicted for a criminal offense before a court as a preliminary to trial of the issues of the case. It is the first act which precedes the trial. In arraignment, the accused is identified by name; the indictment, or charge on which he is held, is read to him; his plea of *guilty* or *not guilty* is heard. Then, if a plea of not guilty is entered, a date may be set for early trial, or time may be permitted in which to prepare an adequate defense. The accused, through his attorney, may, if the facts seem to warrant, argue on the basis of law that the indictment should be set aside. (See PROCEDURE, and the Related Subjects there listed.)

ARREST', the legal act which deprives a person of his liberty. The term comes from a French word meaning *to stop*. A sheriff, his deputy, a justice of the peace, a constable, or any police officer may make arrests. A private citizen may arrest a person who has committed a crime or a breach of the peace in his presence, and officers may arrest persons suspected of committing a crime. Arrests are seldom made in civil cases, but a person defrauding his creditors may be arrested.

Arrest does not necessarily retain a person in jail, unless the crime for which he is held is of so serious a nature that it is not deemed advisable to give him his liberty, particularly the crime of murder. Otherwise he is allowed to furnish bail for appearance for trial.

A person under arrest on any charge is entitled to a hearing as speedily as the machinery of the law makes possible. If one believes himself unjustly accused, he may apply to the court for a writ of *habeas corpus*, which makes it obligatory upon his accusers to show cause for holding him.

If admitted to bail, the accused may enjoy full liberty until his case is called for trial, except that without express permission from those who furnish his bail he must not leave the jurisdiction of the court.

Related Subjects. The reader is referred in these volumes to the following:

Bail	Law
Habeas Corpus	Warrant

ARRONDISSEMENT, *a rawN dees mahN'*, a subdivision of a department in France, similar in a degree to the ward in an American city. See PARIS (Government); DEPARTMENT.

ARROWROCK DAM. See IDAHO (Irrigation).

ARROWROOT, a delicate starch which is so easily digested that it forms one of the favorite foods for invalids and children. The chief difficulty in the way of its use is that it is very often adulterated with potato starch, rice starch, or the starch of common white flour. Arrowroot is prepared from the rootstocks of several species of plants which are natives of tropical regions, but the true arrowroot is from a plant whose home is in the West Indies and the northern part of South America.

This plant is extensively cultivated in nearly all tropical countries. The name is said to suggest the practice of the South American Indians, who use the freshly cut roots to heal arrow wounds. C.M.S.

AR'SENAL, an establishment owned by the government, where arms and munitions of war are manufactured, repaired, and stored. Naval arsenals have to do with ships and their armament; those in the United States and England are called navy yards. Arsenals are usually located far from populous districts. They are gradually becoming simply storehouses for munitions made elsewhere, as private firms are increasing their contracts to supply various governments with arms and munitions.

The first arsenal in the United States was established at Springfield, Mass., in 1777, and the manufacture of rifles and other small arms is still carried on there. The United States government at present maintains arsenals at Pittsburgh, Pa.; Augusta, Ga.; Benicia, Calif.; Columbia, Tenn.; Fortress Monroe, Va.; Philadelphia, Pa.; Indianapolis, Ind.; Augusta, Me.; New York City (Governor's Island); Rock Island, Ill.; Jefferson Barracks, Mo.; Sandy Hook, N. J.; San Antonio, Tex.; Dover, N. J.; Watertown, Mass., and Watervliet, N. Y. Only at Springfield, Rock Island, and Watervliet are there manufacturing plants, the remaining arsenals being storehouses only.

ARSENATE, *ahr' se nate*, **OF LEAD**. See **INSECTICIDES AND FUNGICIDES**, subhead.

ARSENIC, the term commonly applied to a white crystalline powder which is one of the

deadliest poisons known. The correct chemical term for this powder is *arsenious oxide*. Arsenic proper is a metallic element which is seldom found in a free state, but enters into combination with many other substances. Its symbol (see **CHEMISTRY**) is *As*. It is normally a dark-gray color, but readily tarnishes on exposure to the air, becoming first yellow and then black. It is as hard as copper, extremely bitter, and when burned gives off a smell of garlic.

This element itself is seldom used, but its compounds are valuable.

White arsenic is a trade name for a compound composed of arsenic and oxygen. The chemical is used as a remedy for certain skin diseases and anaemia, but it should be taken only as prescribed by a physician, because of its poisonous quality, even in small doses. In combination with copper, arsenic produces a vivid green color which is much employed in the arts, especially in the making of calico and wall paper; but there are strong objections to such use, for it gives off tiny particles which are poisonous. Its use in coloring candies has been entirely prohibited. The specific known as "606," a standard remedy for

syphilis, is an arsenic compound. The element is also used in the preparation of certain sprays for killing insects. See **ANTIDOTE**; **INSECTICIDES AND FUNGICIDES**. T.B.J.

ARSENIOUS OXIDE, *ahr se' ni us ahk' sid*. See **ARSENIC**.

ARSON, *ahr' sun*, in law, the malicious burning by anyone of a dwelling house or other building belonging to another person. This crime gives rise to the charge of murder, in addition, if any person is in the building at the time of firing and the act results in loss of life. To constitute arson in common law, the building burned must belong to another. However, burning one's own buildings for the purpose of obtaining insurance is nearly everywhere a penitentiary offense. But if in this latter case there is no insurance, and no injury to the property of another arises from the burning, the act is not considered a penal



Lower photo: Visual Education Service

ARROWROOT

Above: detail of flower and young leaf; below, a field of mature arrowroot, the height being suggested by the presence of the man and little girl.

offense, though it might develop a hearing to determine sanity.

ART AND THE ARTS. The word *art* brings to the mind a variety of work designed to please the eye and excite the esthetic emotions. To one person it may suggest a beautiful painting; to another, a graceful statue; to another, a noble cathedral. Beauty is almost always associated with it, but not all things that are beautiful are works of art. The traveler home from Europe will recall with equal pleasure the wonders of the Swiss Alps and those of the great paintings in the Louvre at Paris, but in the one case he will say that nature has given man a beautiful group of mountains; in the other, man has used his genius to produce objects of beauty for the happiness of his fellow-beings. Art, therefore, in the true sense, stands for those things which are the creations of man and not of nature. A work of art, then, is the product of man's intellect and imagination, as well as the work of his hands; in the words of Ruskin, "Art is the work of the whole spirit of man."

This word *art* is one of the most elastic in the language. The art of a people includes their sculpture, painting, architecture, etc., and each one of these branches is an art. Furthermore, the power to paint a picture, for instance, and the act of doing it are included in the term, as well as the rules that are observed. Art, however, does not discover the laws by which objects of beauty are created. This is the work of science, and a convenient way to distinguish these two fields of human endeavor is to say that science consists in knowing; art consists in doing.

Art has grown out of the vital needs of the human race. Primitive man needed tools to till the soil, dishes from which to eat and drink, weapons to use in hunting and warfare. At first, he made the unshaped stone, a product of nature, do his work for him; then he learned how to shape it to adapt it to his needs; still later he discovered the uses of different metals and something of the effect of fire on these, and he learned how to mold clay vessels and how to bake them in the sun or in ovens. In the course of time, he began to have a sense of pride in his achievements, and found satisfaction in making his tools and dishes beautiful as well as useful. He found that when the objects about him were harmonious in form and color and arrangement, they gave him much more pleasure than when they were disharmonious, and so it has been man's constant effort to secure that harmony or beauty.

Scope of the Arts. The use of the word *arts* has so widened that it now includes practically all of the industries that require skill in handwork, not only weaving, embroidering, pottery making, and the like, but the various trades, such as carpentry, blacksmithing, etc.

These are grouped under the name *useful*, or *mechanic arts*, while painting, sculpture, architecture, music, and poetry—the arts of beauty—are known as the *fine arts*. Often it is difficult to set a hard and fast rule as to the use of the above terms, for in some of the arts, notably architecture, beauty and usefulness are inseparable.

Art in the Schools. The study of art in schools of elementary and high-school grade has become very general. It includes not only drawing, but art appreciation, as well. Its purpose is not to make artists of the pupils nor to develop a high degree of technical skill, but rather to cultivate the powers of observation and encourage the use of drawing as a language for the expression of ideas. The courses of study cover such subjects as form, color, design, and construction of the articles used in everyday life; the principles of composition employed in the selection and arrangement of objects for drawing; and the development of skill in the representation of the characteristic properties of such objects.

The outcome of these courses should be the development of standards of taste and judgment which will enable pupils to enjoy the beautiful in nature and in art.

The tendency to be avoided is formalism, that is, mere representation for its own sake. This may be done by keeping the work closely related to the experience and interest of the pupils, and helping them to apply the principles which they learn to their own environment.

B. M. W.

Related Subjects. The index that follows does not show the full extent of the treatment given to art in these volumes, for the details relating to the fine arts, sculpture, painting, architecture, and music, are indexed under those topics. This list refers only to the more general articles:

Architecture	Japanning
Arts and Crafts	Landscape Gardening
Basketry	Lapidary
Books and Bookbinding	Lithography
Caricature	Metallurgy
Cartoon	Mezzotint
Cast	Mosaic
China Painting	Music
Corcoran Art Gallery	Niello
Costume	Painting
Crayons	Perspective
Daguerrotype	Photo-Engraving
Drawing	Photography
École des Beaux-Arts	Pottery
Embossing	Rookwood Pottery
Embroidery	Sculpture
Enamel	Stained Glass
Engraving	Stencil
Etching	Stereotyping
Etruscan Art	Taxidermy
Fine Arts	Vase
Gilding	Wedgwood Ware
Half-tone	Wood Engraving
Industrial Art	Zinc Etching
Intaglio	

Artists who cannot be classified under a specific heading as painters, sculptors, cartoonists, or architects follow:

Christy, Howard C.	Fisher, Harrison
Cruikshank, George	Flagg, James M.
DuMaurier, G. L. P. B.	Gibson, Charles D.

Greenaway, Kate
Palissy, Bernard
Pennell, Joseph

Pyle, Howard
Shaw, Henry W.
Tenniel, Sir John

ARTAXERXES, *ahr takz urk' seez*. See **ANABASIS**; **CYRUS** (the Younger).

ARTEMIS, *ahr' te mis*, the Greek name for the twin sister of Apollo, the virgin goddess whom the Romans called Diana. See **DIANA**.

ARTERIES, *ahr' te riz*, are tubes, or vessels, through which blood is pumped by the heart to various parts of the body. With the veins and capillaries, they form the pipelines of the great circulatory system, of which the heart is the central pumping station. The details of the process by which the blood is sent to all parts of the body may be found in these volumes under the heading **BLOOD** (Circulation of the Blood).

The system of arteries begins at the heart. A large artery called the *aorta* rises from the left ventricle and carries pure red blood to the tissues of the body; from the right ventricle rises the *pulmonary* artery, which carries impure blood to the lungs. The *aorta* extends upward from the heart and then curves downward so as to form an arch. In the lower abdominal region it divides into the right and left *iliac* arteries; these are continued into the lower extremities, where they are known as the right and left *femoral* arteries. Branches of the femoral arteries form a network through the lower limbs. The right and left *subclavian* arteries spring from the *aorta* and extend to the shoulders, being continued in the *brachial* arteries of the arms. The head is supplied by two *carotid* arteries, and the heart by the *coronary* arteries. Important branches are given off throughout the length of the *aorta* to carry blood to all the abdominal and pelvic viscera.

The walls of the arteries are composed of three coats, or layers of tissue. The outer layer is predominantly elastic tissue; the middle is muscular; the inner coat consists of thin, smooth cells that serve as a lining and prevent friction. In the *aorta* and larger arteries near the heart, the arterial walls are composed chiefly of elastic tissue, for these tubes, by virtue of their elasticity, pass on the wave of blood forced into the *aorta* with each beat of the heart (see **PULSE**). The walls of the smaller arteries are principally muscular tissue, which enables them to undergo the extension and distension necessary for a steady rate of flow.

Thus, with each heartbeat the arteries are distended to take care of the increased volume of blood. By the slow contraction of the muscular walls of these vessels, the blood is gradually forced onward toward the capillaries. In this way, a steady flow of blood is maintained in the smaller arteries. If the arteries were not capable of this change in size, but were rigid tubes, spurts of blood at high pressure would be forced through them after each heart-

beat, and between beats there would be little blood left in the arteries. This is exactly the sort of thing that happens when the arteries become hardened by the disease known as arteriosclerosis.

Hardening of the Arteries, known technically as *arteriosclerosis*, is a common disease of middle age and later. Instead of possessing a pliable, elastic arterial system, the victim of arteriosclerosis has a set of rigid tubes whose walls have become thickened and brittle. Various parts of the arterial system may be affected, and to a varying degree, depending upon the stage and cause of the disease.

The condition may be widespread, affecting the greater part of the entire arterial system, or it may be limited to relatively small areas. High blood pressure nearly always accompanies widespread arteriosclerosis, but whether the condition is cause or effect is not definitely known. There is always danger, however, that with this condition the increased tension within the brittle vessels may be sufficient to cause their rupture, and thus produce hemorrhage. There are certain locations in the body where this trouble is most apt to happen, the most common site being in the brain. Hemorrhage in the brain causes the familiar condition known as *apoplexy*.

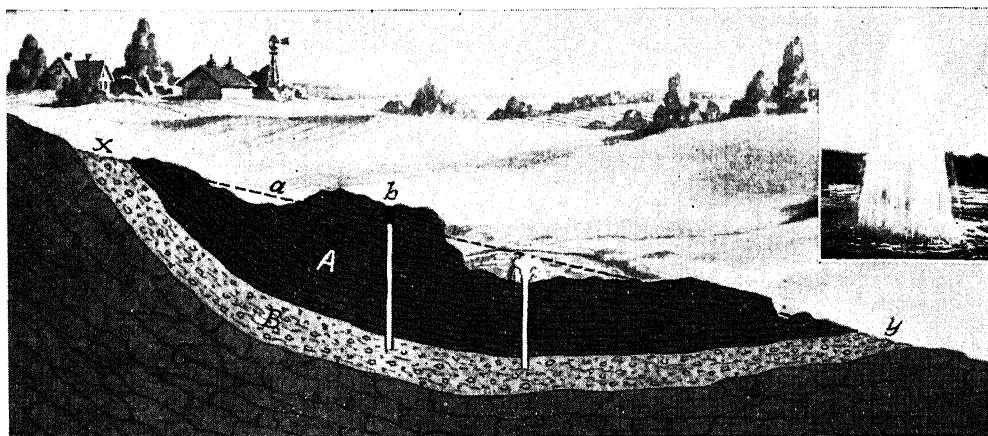
Another complication which is apt to occur in arteriosclerosis involves the kidneys. The small arteries in the kidneys become sclerotic, and so interfere with the normal function of these organs. This condition leads to what is known as *nephritis*. And finally, as a result of the increased blood pressure accompanying arteriosclerosis, the heart must work doubly hard to keep the blood flowing through the arteries. This work may prove too much for it, and death may result from heart failure. The most important treatment for these conditions is rest and hygienic living. Early inauguration of such treatment may result in effective cure.

The causes of arteriosclerosis are obscure. The wear and tear of life is probably responsible for many cases of arterial hardening in old age. Some cases may result from attacks of infectious diseases. Others may be due to constant infection with bacteria lodged in poisoned tonsils, sinuses, or gums. Disorders of the ductless glands, obesity, lead poisoning, overeating, especially of proteins, and over-indulgence in tobacco and alcohol are believed to have their share of responsibility. K.A.E.

Related Subjects. For supplementary information, the reader is referred in these volumes to the following articles:

Aorta	Heart
Bleeding	Life Extension
Blood Pressure	Pulse
Capillaries	Veins

ARTERIOSCLEROSIS, *ahr te' ri o sklee ro'-sis*. See **ARTERIES** (Hardening of the Arteries).



ARTESIAN WELL

Cross section of an artesian basin, showing hydrostatic grade, which determines the "head" or height to which the water will rise. The solid area is the land profile; the broken line, the hydrostatic grade. In the diagram, *A* is the overlying clay; *B*, the sandstone stratum; *C*, the granite, or impervious rock; *x* shows the point of intake, and *y* the outlet of springs; at any point below the dotted line *xay*, or hydrostatic grade, the water will flow, while at points above the line, such as *b*, there will be no flow. The small inset shows an artesian well in Southwest Kansas; the flow is projected upward through the waters of a lake. (Photo inset: Visual Education Service.)

ARTESIAN, *ahr te' zhan*, **WELL**, a well formed by boring or drilling into a layer of porous earth or rock which brings water from some higher point. Such a layer, or *stratum*, lying between two impervious layers of rock or clay, is shown at *B*, in the above illustration. The rain falls upon it where it is exposed, and seeps inward, prevented by the harder rock below from going directly down. If a well is bored at any point between the outcropping ends, water will be forced up into it, perhaps flowing freely at the surface, according to the principles explained by the lower half of the illustration. The name *artesian* was formerly restricted to flowing wells, and is derived from the province of Artois, France, where this type of well was first popular.

Most artesian wells supply pure drinking water, excellent for domestic purposes and for stock, though often containing minerals. They are common in many regions where surface water of good quality is not easily obtained. In recent years, a large number of them have been bored in states east of the Appalachian Mountains, and many cities now obtain their supply of water from them. They are also used extensively for irrigation. Some wells are very deep. One in Pittsburgh, Pa., is 4,625 feet, and one in Galveston, Tex., is over 3,000 feet deep. The deepest well in the world, at Leipzig, Germany, has a depth of 5,735 feet. For the method of sinking artesian wells, see **WELL BORING**.

A.L.F.

ARTHRITIS, *ahr thry' tis*, an inflammation. See **PYORRHOEA**.

ARTHROPODA, *ahr throp' o dah*, a term from two Greek words meaning *jointed foot*,

used to describe the largest phylum (major division) of the animal kingdom (see **ZOOLOGY**). All the members of this group are characterized by having jointed appendages. The arthropods range from the tiny beach fleas and water fleas to the lobsters and king crabs, and include the spiders and scorpions, the cockroaches, grasshoppers, and dragon flies, and the beetles, bees, butterflies, gnats, and flies. The bodies as well as the appendages are in joints, or segments, and in typical forms each segment carries a pair of the appendages, which have special functions to perform. Most of these are used for walking or swimming, but some are suckers, some are jaws, and others are organs of sense or weapons that are well adapted to offense and defense.

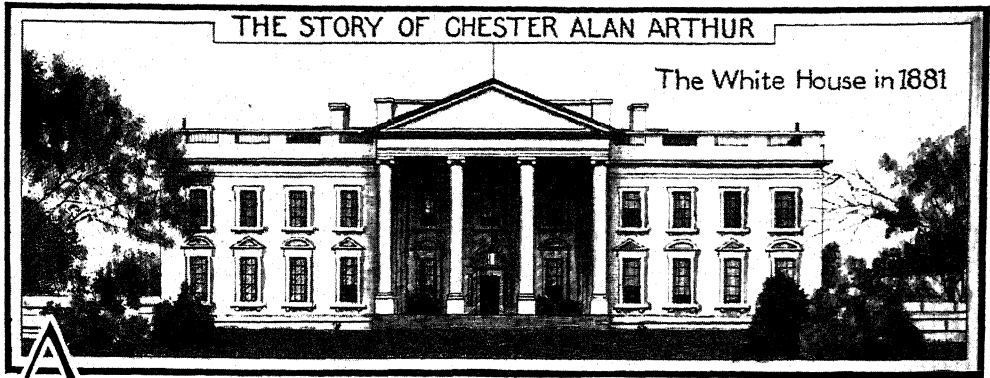
The arthropods have an external skeleton or shell of chitin, though in some forms, as the flies or moths, this is so soft as scarcely to deserve the name. In others, as the lobsters, it is very hard and strong. Nearly all have a blood vascular system with some kind of heart, a well-organized nervous system, and simple or compound eyes. The most important classes of arthropods are the *Crustacea*, represented by the crayfish and barnacle; the *Myriapoda*, containing millipedes and centipedes; the *Insecta* (insects); and the *Arachnida*, including spiders and scorpions. S.H.S.

Related Subjects. For a detailed discussion of the animal forms belonging to this great group, see the following articles, and the lists included under some of them:

Arachnida	Lepidoptera
Crustaceans	Myriapoda
Hemiptera	Neuroptera
Insect	Orthoptera
Zoölogy (Divisions of the Animal World)	

THE STORY OF CHESTER ALAN ARTHUR

The White House in 1881



ARTHUR, CHESTER ALAN (1830-1886), the twenty-first President of the United States, one of the six men who have become President without being elected to that office; the others were Tyler, Fillmore, Johnson, Roosevelt, and Coolidge. In the campaign of 1880, the Republican party was divided; one faction, led by Conkling and Platt, the leaders of New York Republicans, favored the nomination of Grant for a third term; the other was willing to unite on any man to defeat Grant. The man chosen was James A. Garfield, but to appease the defeated Conkling faction, the Republicans nominated for Vice-President Chester A. Arthur, one of Conkling's chief lieutenants. Through the tragic death of Garfield, Arthur became President.

Previously, even as Vice-President, he had won an unenviable reputation for his activity in partisan politics, and he was commonly considered a clever lawyer and politician who was working chiefly for his own interests. To his credit, however, stands the record of his Presidential administration, for the new responsibilities thrust upon him worked a great change in his character. Though his term was not marked by brilliance or events of dramatic significance, Arthur proved himself one of the fairest, most honest and fearless of Presidents. So clear is the division in his career that his life is best treated in two sections.

Early Life and Rise to Power. Chester Alan Arthur was born on October 5, 1830, at Fairfield, Vt. William Arthur (1796-1875), his father, a native of County Antrim, Ireland, was a teacher and Baptist minister who seemed unable to remain long in any community; he lived at various times in Vermont and in Quebec. These family wanderings nearly cost his son the Presidency, for in 1880 it was charged that Arthur was really born in Canada. It was evident, however, that Fairfield was his birthplace. His mother was an American, Malvina Stone, who was living in Canada when she met and married William Arthur.

Young Chester seems to have suffered little from the family wanderings, and at the age

of fifteen he entered Union College, Schenectady, N. Y., as a sophomore. After his graduation with honors in 1848, he taught school for several years, using all his spare time to study law. In 1853 he entered a law office in New York City, and within the next six or seven years won for himself a leading position at the bar. He was successful as associate counsel for the state in the Lemmon case, in which the state courts held that negro slaves brought into New York, even while on the way from one slave state to another, became free as soon as they set foot in New York. This was a test of the validity of the Fugitive Slave Law. In another famous case he won equal rights for negroes and whites in the street cars of New York City.

For two decades he was a successful practicing lawyer, and at the same time was active in Republican politics. During the first two years of the War of Secession he rendered excellent service as inspector general and quartermaster general of the New York troops. After the war, he continued his political activities, worked for the election of Grant to the Presidency, and was rewarded in 1871 with the position of collector of the port of New York. The customs service was honeycombed with dishonesty and inefficiency; appointment to it was usually a reward for votes delivered at a previous election. General Arthur was opposed to civil-service reform, and managed his office according to the time-honored principle, "To the victors belong the spoils." It is true, however, that he made fewer removals and appointments for political reasons than any of his immediate predecessors, and his business management was never questioned.

When President Hayes in 1877 undertook the reform of the civil service, he began with the New York Customs House. The report of an investigating commission recommended numerous changes in its organization, and President Hayes demanded the resignation of Arthur and his two principal subordinates. Although Arthur admitted the existence of the evils, he refused to resign because he felt no

personal guilt. The abuses were the result, he claimed, of a system for which he should not bear the blame. Arthur was vigorously defended by Senator Conkling, but during a



Photo: Brown Bros.

CHESTER ALAN ARTHUR

Vice-President, who, by the assassination of President James A. Garfield, became the fourth "accidental" President of the United States.

recess of the Senate he was removed by the President, on July 11, 1878. Early in 1879 this action was approved by the Senate, after violent controversy.

In the Republican national convention of 1880, Arthur was a delegate-at-large from New York, and worked hard for the nomination of General Grant for a third term. Garfield, however, was nominated for President, but the Grant-Conkling faction was allowed to name Arthur as candidate for Vice-President. Immediately after his inauguration as Vice-President, Arthur sided with Conkling against the President in the great fight over political patronage in New York. The assassination of Garfield occurred in July; he died in September, and on September 19, 1881, Arthur became President of the United States.

The Administration of Arthur. The death of Garfield at the hands of a disappointed office-seeker gave a new impetus to the movement for civil-service reform. A National Civil Service Reform League was organized under the presidency of George William Curtis, and in 1883 Congress passed the Pendleton Civil Service Act, which provided for a classified list of government employees and promotion after competitive examination. Though

previously an advocate of the spoils system, President Arthur gave the new system his earnest support.

The Tariff. For a decade after 1879, the United States had a steadily growing surplus in the Treasury. This condition led first to extravagant and wasteful appropriations, such as the Rivers and Harbors Act of 1882, which Congress passed over the President's veto. This bill appropriated about \$18,000,000 for "improvements" which were nothing but sops handed to the voters of certain districts to influence the reelection of Representatives. The second effect of the surplus was to strengthen the demand for tariff reduction. The report of a preliminary commission recommended a reduction in duties of twenty to twenty-five per cent, but the law of 1883, when finally approved, actually increased the most important revenue-producing duties. It did make large reductions in internal-revenue taxes, but was unsatisfactory to both parties.

Other Legislation. Two other important laws deserve consideration, the Edmunds Anti-Polygamy Act and the Chinese Exclusion Act, both passed in 1882. The Edmunds Act prohibited polygamy in territories of the United States and was directed principally at Mormons. The Chinese Exclusion Act was passed as the result of the agitation against cheap foreign labor, which it was claimed would prevent American workmen from obtaining a living wage. It forbade the immigration of Chinese for ten years, and prohibited naturalization of Chinamen already in the United States.

Prosperity of the South and West. The industrial progress of the New South was demonstrated at the Atlanta Cotton Exposition in 1881 and the New Orleans Cotton Centennial Exposition in 1884. The cotton crop had increased from fewer than 5,000,000 bales a year to more than 8,000,000, and the South had also begun to raise greater quantities of wheat, corn, early fruits, and vegetables. There was also a marked advance in manufactures, and in Alabama mining suddenly became a great industry. The West, too, was making rapid strides, and three transcontinental railroads were completed. Previously, the Union Pacific had been the only great road to the Pacific coast, but there were completed the Southern Pacific in 1881, the Northern Pacific in 1883, and the Atchison, Topeka & Santa Fé in the same year.

Miscellaneous Events. Arthur's administration was marked by at least two events whose results now are taken as a matter of course by every American. One of these was the reduction of the postage on letters from three cents to two cents; the other was the adoption of the system of standard time. The Brooklyn Bridge, at the time of its completion regarded

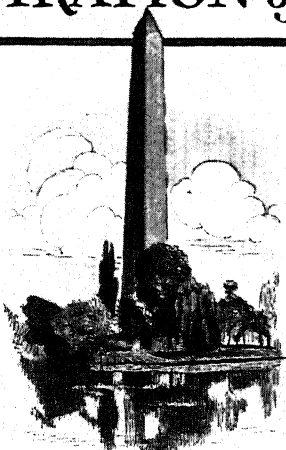
ADMINISTRATION of ARTHUR

1881

1885



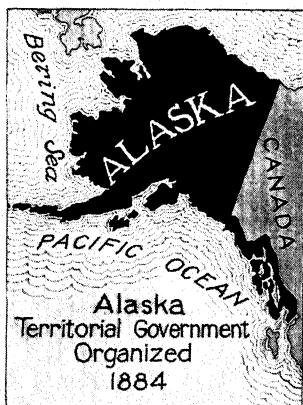
Emerson
Died in 1882



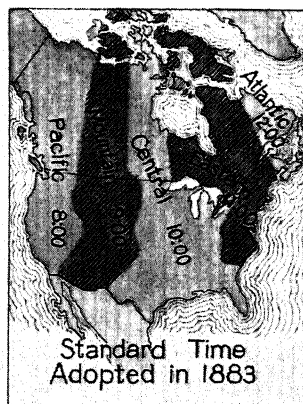
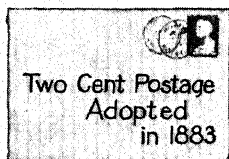
Washington Monument
Dedicated in 1885



Longfellow
Died in 1882



Red Cross Society
Organized in 1881



Brooklyn Bridge
Completed in 1883

OUTLINE AND QUESTIONS ON CHESTER A. ARTHUR

Outline

- | | |
|---|--|
| <p style="text-align: center;">I. Early Life</p> <ul style="list-style-type: none"> (1) Birth and parentage (2) Education (3) Practice of law (4) Defense of negroes <p style="text-align: center;">II. Political Career</p> <ul style="list-style-type: none"> (1) Collector of the port of New York (2) Opposition to civil-service reform (3) Republican national convention of 1880 (4) Elected Vice-President <p style="text-align: center;">III. Administration</p> <ul style="list-style-type: none"> (1) Legislation <ul style="list-style-type: none"> (a) Chinese Exclusion Act, 1882 (b) Edmunds Anti-Polygamy Act, 1882 (c) Tariff Act of 1883 (d) Pendleton Civil Service Act, 1883 | <ul style="list-style-type: none"> (2) Other governmental affairs <ul style="list-style-type: none"> (a) Alaska made a territory (b) Bureau of Labor organized (c) Two-cent postage adopted (d) Standard Time system introduced (3) Other events <ul style="list-style-type: none"> (a) Three transcontinental railways completed (b) American Red Cross Society formed (c) Brooklyn Bridge built (d) Deaths of Emerson and Longfellow (e) Prosperity of the South <ul style="list-style-type: none"> 1. Atlanta Cotton Exposition 2. New Orleans Cotton Centennial Exposition (4) Election of 1884 <ul style="list-style-type: none"> (a) Candidates (b) Issues (c) Result |
|---|--|

Questions

Why was it easier to go from the eastern to the western coast of the United States at the close of Arthur's administration than at the beginning?

What was the "spoils system" of which he was an advocate during his early political career?

What reform undertook to do away with it?

Why was Arthur chosen for Vice-President?

What tendencies of the time were shown by the Rivers and Harbors Act and how did the President regard the act?

What two measures were introduced by the Postoffice Department during this administration? Have they proved successful?

How did the elections of 1882 and 1884 express the country's opinions?

Did the President's party control Congress?

How did he attract public attention during his term as Vice-President?

Why was Alaska called "Seward's Folly"?

What step was taken during this administration in regard to Alaska, and was it considered a great event?

What was the most important measure passed by Congress at this time?

How did the story of Arthur's father figure in the campaign of 1880?

What was done to the tariff in this administration?

What labor law did President Arthur sign?

How many men besides Arthur ever became President without having been elected to that office? Who were they?

What showed the prosperity of the South during this administration?

What "wonder of the world" was completed during Arthur's term?

Who is the honorary president of the American Red Cross?

What had been the outstanding merits of James G. Blaine, who defeated Arthur for the Presidential nomination in 1884?

In any one year has the number of immigrants to the United States exceeded the number who entered the country in the year 1882?

During Arthur's administration, who was mistress of the White House?

as one of the wonders of the world, was opened in 1883, and Alaska was established as a territory in 1884. An event of national importance was the organization of the American Red Cross Society in 1881, under the presidency of Miss Clara Barton.

Presidential Campaign of 1884. President Arthur did not entirely escape the consequences of his long association with partisan politics in New York state. His intimate friend and Secretary of the Treasury, Charles J. Folger, was defeated for governor of New York in 1882, largely as a protest against the methods of the Republican party managers. In 1884, Arthur allowed his name to be presented to the Republican convention for nomination for a full term in the Presidency, but he was easily defeated by James G. Blaine. This defeat was due not primarily to any faults attributed to Arthur, but rather to the ambitions of other Republicans. The Democrats nominated for President the governor of New York, Grover Cleveland, who had defeated Folger in 1882.

In the campaign that followed, there was much bitterness, and charges and counter-charges filled the air. The political issues were subordinated to the personalities of the candidates. The election resulted in the choice of the Democrat, Cleveland, who secured 219 electoral votes; Blaine received 182 votes, though Cleveland's plurality with the voters was only about 62,500.

Arthur, defeated for the nomination, gave his support to Blaine, although the two men had been political foes for years. At the end of his term, Arthur retired to New York City, where he died on November 18, 1886. E.D.F.

Other Items of Interest. When President Arthur signed the bill making Alaska a territory, that region was still thought of as "Seward's Folly." It then had only 400 whites in its population.

The two-cent postage rate at first applied only to letters of a half-ounce or less. In the next administration, the limit was made one ounce, as it stands now. The reduction from three cents did not lessen the post-office revenues, even in the first year.

Another venture of President Arthur's Postoffice Department was the introduction of postal notes, which were abandoned in 1894.

In 1881, the year in which both Garfield and Arthur were inaugurated, immigration broke all records. In the next year there were 788,992 arrivals.

While Arthur was Vice-President, his party had a bare majority in the lower House and depended on his own vote in the Senate. After the elections of 1882, there was a Democratic majority of more than eighty in the House and a Republican majority of four in the Senate.

President Arthur was tall and well formed, a man of such distinguished presence as to be noteworthy in any assemblage.

His friends and family were devoted to him, and his kindly, affable manner won him the enthusiastic regard of those who knew him even casually.

He took the oath of office as President in his own home on Lexington Avenue, New York City, but later he repeated it in the Vice-President's room of the Capitol at Washington.

His tact and his breadth of view were shown on the occasion of the dedication at Yorktown, Va., of a monument to commemorate the surrender of Corn-



wallis. On that occasion he ordered a salute fired in honor of the British flag "to show the respect entertained by the American people for the illustrious sovereign and gracious lady who sits upon the British throne."

Two of the six statesmen mentioned in the above article as being elected Vice-President and coming into the higher office on the death of the President—Theodore Roosevelt and Calvin Coolidge—unlike the others, were at the next election chosen for full terms.

Mistress of the White House. During President Arthur's tenure of office, the White House was presided over by his youngest sister, Mary Arthur McElroy, who cared for his young daughter with her own. She was beautiful and popular, and the social life of the White House was very gay. Mrs. McElroy inaugurated the custom of serving tea to several hundred invited guests after the public receptions.

President Arthur's wife, Ellen Lewis Herndon Arthur, was born in Virginia in 1837, the daughter of Commander William Lewis Herndon of the United States navy, who attained some fame for exploration of the Amazon River. Mrs. Arthur died in 1880, early in the same year in which her husband's name was placed on the Republican ticket for Vice-President. They had three children: two boys, one of whom died in infancy, and one daughter.

Related Subjects. The reader will add to his information relating to the life and times of this President by reference in these volumes to the following articles:

Brooklyn Bridge
Chinese Exclusion
Civil Service

Conkling, Roscoe
Garfield, James A.
Standard Time

ARTHUR, JULIA, the stage name of IDA LEWIS (1869-), a Canadian actress, born in



Photo: U & U

MARY ARTHUR McELROY
Sister of President Arthur,
and mistress of the White
House during his adminis-
tration.

Hamilton, Ont., best known for her performances of Rosalind in *As You Like It* and of other Shakespearean characters. She made her first professional appearance on the stage at the age of fourteen, as the Prince of Wales in Shakespeare's *Richard III*. After meeting with much success in this and other parts, she became in 1895 a member of the company headed by Sir Henry Irving and Ellen Terry, with whom she played for several seasons, both in England and America. In 1898 she married B. P. Cheney, Jr., and two years later retired from the stage. In 1926, after an interval of sixteen years, she again played in Shakespearean rôles, on the occasion of the celebration of the tercentennial of Shakespeare's death. One of her rôles was that of the star in *The Eternal Magdalene*.

ARTHUR, KING. Tennyson's *Idylls of the King*, Lowell's *Sir Launfal*, and many other writings, both in prose and poetry, have been inspired or colored by the legend of King Arthur and his Knights of the Round Table. According to the usual form of the story, Arthur ruled over the Britons in the sixth century. With the beautiful Guinevere, his wife, he maintained his court at Caerleon-on-Usk, in Wales, and here, in the hall of the palace, he was wont to gather with his knights about a circular marble table, the celebrated Round Table.

The king restored peace and order to his country, and his loyal knights went about doing good, but while he was away on an expedition to Rome a rebellion was launched by a number of traitors under the leadership of Modred, Arthur's nephew. After the king's return, he was sorely wounded in a battle fought against the rebels, and was carried

away to an island to be healed. The belief that King Arthur would return and set up his rule again was treasured for many years, and it is possible that the story has some basis in history. See *IDYLLS OF THE KING*; *ROUND TABLE*.

ARTICHOKE, *ahr' ti choke*, the name of two different plants belonging to the composite family, both of which are of economic value. They are described below.

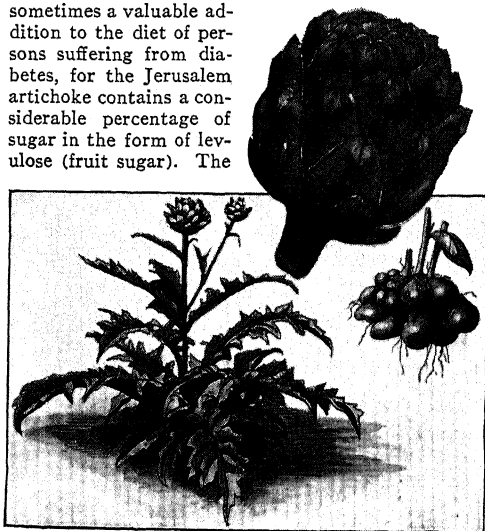
Globe Artichoke. This is a thistlelike plant, of gray-green effect, used in European countries and to a limited extent in the South as a table vegetable. The stalk grows to be two or three feet tall and bears several branches, on the ends of which appear large heads of blue and white feathers. The leaves are large and prickly. The parts eaten are the bases of the fleshy, scalelike leaves enclosing the unopened flower bud, and the base of the bud. Europeans are very fond of the delicate flavor of the globe artichoke, and serve it both raw as a salad, and cooked. Most commonly, the buds are boiled in salted water, and their fleshy leaves are pulled off and eaten with melted butter or a white dressing. The bottoms of the buds are sometimes dipped in batter and fried in fat. In America, the globe artichoke has never come into general use as a table food, though it is found in large city markets. Its commercial production is limited to California and the South, for the plant is not hardy.

Jerusalem Artichoke. This is a species of sunflower, whose edible tubers are much like potato tubers. The culture of this plant is also similar to that of the potato (which see), and the yield is over ten tons of tubers per acre. The tubers are used as food for stock, and also as a table vegetable. Artichoke flakes, manufactured by the same process as potato chips and other tuber products, are now on the market. These are sometimes a valuable addition to the diet of persons suffering from diabetes, for the Jerusalem artichoke contains a considerable percentage of sugar in the form of levulose (fruit sugar). The



KING ARTHUR

From a bronze statue by Peter Vischer (1455-1529), who was of the German school of sculpture. The statue is in the Innsbruck (Austria) Hofkirche.



THE GLOBE ARTICHOKE

United States Bureau of Standards is engaged in experimental work which is expected to lead to the production of levulose on a commercial scale and

greatly increase the country's output of sugar. Because the tubers can be stored in the ground over winter and not suffer deterioration, the period of operation of sugar factories can be prolonged each year if artichokes are used to supplement the more perishable sugar beets and cane

B. M. D.

Scientific Names. Artichokes belong to the family *Compositae*. The globe artichoke is *Cynara scolymus*; the Jerusalem, *Helianthus tuberosus*.

[See CHEMISTRY (Contributions of Chemistry to Human Welfare)]

ARTICLE, *ahr' ti k'l*. There are two articles in English grammar—the and a (*an*)—and they classify as *limiting adjectives*, because they point out, without describing. At one time, they formed a separate part of speech, making nine instead of eight, as now taught by grammarians.

Originally the word *a* or *an* meant the same as *one*—a meaning still preserved in such expressions as *two of a kind*, *nearly of a size*, *three at a time*, and the like. In its present usage, however, it does not emphasize number, but is closely akin to the word *any*; that is, *a dog* refers to any member of the dog family. Therefore, *a* and *an* are called the *indefinite articles*. *The*, on the other hand, is a weakened form of *that*, and because it points out in a more definite way, it is called the *definite article*. *The dog* means the particular animal under discussion or about which something is to be asserted; or it may mean dogs as a class, as in the sentence, "The dog is man's staunchest friend." *The* may also be used to emphasize supremacy; as, "This is the novel of the year."

When to Use "An." Until the middle of the twelfth century, the article had only one form—*an*—but about that time people began to drop the *n* before words beginning with a consonant sound. This tended to make speech more euphonious. The rule, however, was not always observed, for in the *Canterbury Tales* Chaucer writes, "Thou lookest as thou wouldest find *an* hare," and in Shakespeare and the Bible are expressions like *an usurer* and *an one*, where spelling rather than pronunciation dictated the form of the article.

The present rule is, "Use *an* before a vowel sound and *a* before a consonant sound." This means that a word beginning with silent *h* is considered to begin with the vowel that follows it, and one beginning with *e* or *eu* sounded like *yu* is considered to begin with a consonant. Thus:

An apple	An heir
An action	An honor
An exception	An unused book
An old shoe	An uphill climb
A plum	A hero
A deed	A humble home
A rule	A used book
A new ulster	A European tour

Many of the older textbooks teach that it is necessary to use *an* before words beginning

with *h* and accented on the second syllable; as, *an hysterical woman*, *an historical novel*, *an habitual criminal*, *an hereditary crown*. Some modern texts do not endorse the older form.

Articles Used as Other Parts of Speech. In the expression, "The sooner the better," *the* is not an article, but an adverb, modifying the adverbs *sooner* and *better*; the sentence being a short form for, "The sooner we go, the better I shall like it," or something equivalent. Similarly, *a* is used as part of an adjective phrase in "many *a* man," and as a preposition in the Baby Bunting line, "Papa's gone *a*-hunting." Here and in similar expressions like *a-flying*, *a-whistling*, and the like, the *a* replaces an old preposition, *an*, meaning the same as our *on*.

Repetition of the Article. When a boy announces, "I have a brown and a white dog," his hearers are justified in crediting him with being the master of *two* dogs, one brown and the other white. If he says, "I have a brown and white dog," he means, if he is careful about his English, that he has only *one* dog, a mixed brown-and-white in color. Similarly, we are correct in saying, "She is the wife and mother," referring to a woman accompanied by her husband and children; and "The wife and the mother of Senator Harper were both present at the reception," since two different women are involved. Again:

A novelist and artist named DuMaurier was the author of *Trilby*.

A novelist and an artist were appointed on the committee.

We are studying the life of Burbank, *the scientist and plant-breeder*.

We are studying the life of *the great scientist* Marconi, and *the famous plant-breeder*, Luther Burbank.

The manager and bookkeeper, Mr. Smith, is in charge of that work.

The manager and the bookkeeper favored different methods of classifying the accounts.

The rule involved in all these examples is that the article is not repeated before each of two or more connected nouns when they refer to the same person or object; it *must* be repeated if different persons or things are meant. The seeming contradiction in such sentences as "He spoke of Washington, the soldier, the patriot, the statesman," is explained by the fact that the repetition of the article gives additional emphasis. The statement is perceptibly weaker if made to read, "He spoke of Washington, the soldier, patriot, and statesman." Macaulay makes use of this rhetorical effect in the sentence, "James was declared a mortal and bloody enemy, a tyrant, a murderer, and a usurer."

When the Article Is Superfluous. "The spider is not an insect, but a curious kind of *an* animal." The italicized article is superfluous, because *a* refers to *one of a class* and therefore cannot be used with a word referring

to an entire class, such as *kind*, *sort*, *species*, or *variety*. The correct form is, "The spider is not an insect, but a curious kind of animal." Wesay, "I had the same sort of experience," "This is an unusual species of fern," and so on. The article is also superfluous before a word taken simply as a name. Thus, it is incorrect to say, "He does not deserve the name of a father"; "Cromwell was given the title of a Protector." These sentences should read, "He does not deserve the name of father"; "Cromwell was given the title of Protector."

The article is incorrectly used in such sentences as, "Barrie's *The Little Minister* is a popular and charming book," for the reason that an article cannot properly come between a possessive and the word it governs. The correct form is, "Barrie's *Little Minister* is a popular and charming book," or, possibly better, "Barrie's novel, *The Little Minister*, is a popular and charming book."

Common Errors. The rule explained in the paragraph entitled *Repetition of the Article* is the one most frequently violated, but the construction appears in so many different forms that a few additional examples will be found helpful. Other frequent mistakes are also included in the following list:

I read the first and last verse, for I read the first and the last verse (or, the first and last verses). Where different things are referred to, the article must be repeated where the noun is singular; ordinarily, only the first adjective requires the article where the noun is plural. Its repetition may in some cases be necessary for clearness.

The young and old doctor occupied the same suite, for The young and the old doctor occupied the same suite. The same man cannot be both old and young; since different persons are implied, the article must be repeated.

The plumber and carpenter were already on the job, for The plumber and the carpenter were already on the job. Since the plural verb implies two different men and not one man doing both the plumbing and the carpentering, the article calls for repetition.

The thought is more clearly brought out in the Latin and Greek version, for The thought is more clearly brought out in the Latin and the Greek version (or, in the Latin and Greek versions). The same thing cannot be both Latin and Greek. In such forms as *The game was played with the black and the white counters*, repetition of the makes it clear that two kinds of counters were used.

If such an one is present, let him step forward, for

Outline on the Article

- I. Origin and meaning of *a* and *the*
- II. When to use *an*
- III. Articles used as other parts of speech
 - (a) Adverb
 - (b) Adjective
 - (c) Preposition
- IV. Repetition of the article
 - (a) Rule and examples
 - (b) Exception for rhetorical effect
- V. When the article is superfluous
 - (a) After *kind of*
 - (b) After *name, rank, or title of*
 - (c) After a possessive
- VI. Parsing the article
 - (a) Two essential things to tell
 - (b) Type sentence
- VII. Common errors

If such a one is present, let him step forward. One, being pronounced as though spelled won, properly takes the article a.

I have no patience with that kind of a mistake, for I have no patience with that kind of mistake. The insertion of *a* makes the mistake particular, limiting it to one of a class, whereas the word *kind* has the opposite meaning of an entire class.

The diphtheria is a dangerous disease, for Diphtheria is a dangerous disease. The definite article can be used only when a particular person or thing is pointed out. It is not required before a word taken in a general sense. B.M.W.

ARTICLES OF CONFEDERATION, the written instrument of government adopted in 1781 by the thirteen new American states, which were then fighting for independence. It took a brief experience with this form of weak confederation to prove that a strong government was impossible under such a basic law, but out of the trials and mistakes of this "critical period of American history" were born a new Constitution and a new nation, the United States of America.

The reasons for the failure of the Confederation were numerous, but they may be summed up in the statement that each of the states was an independent country, and together they merely formed a more or less "firm league of friendship with each other" (Article III). Article II stated expressly that—

Each state retains its sovereignty, freedom, and independence, and every power, jurisdiction, and right which is not by this Confederation expressly delegated to the United States in Congress assembled.

The government under the Confederation was in the hands of Congress, which included not fewer than two nor more than seven delegates from a state, each state having, however, but one vote; the vote of each state was cast as the majority of its delegates decided. Congress could decide disputes between the states, but had no power to regulate commerce or to raise revenue; it could declare war, but could not raise troops; it could make appropriations, but could not collect taxes; it could pass laws, but could not compel their observance; it could borrow money, but could not guarantee its repayment. When Congress was not in session, the government was administered by a "committee of the states," composed of one delegate from each state.

The Articles of Confederation were drawn by a committee of Congress appointed on the same

day as was the committee to draw up the Declaration of Independence. The Articles were reported to Congress in July, 1776, but they were not adopted until November, 1777. They were then submitted to the state legislatures, whose unanimous consent was necessary to make them effective. By May, 1779, twelve of the states had ratified the Articles, but Maryland demanded that New York, Virginia, Connecticut, and the other states give up their claims to the lands west of the Allegheny Mountains. Not until all the states had agreed to cede their claims to the Federal government did Maryland ratify the Articles, on March 1, 1781. Thus, the Revolutionary War was almost over before the states could agree on a form of government. See ANNAPOLIS CONVENTION; CONSTITUTION OF THE UNITED STATES. E.D.F.

[The text of the Articles of Confederation, too long to be inserted here, may be purchased for five cents from Directors of the Old South Work, Old South Meeting House, Boston.]

ARTICULATION, *ahr tik u lo' shun*, in anatomy, is a term applied to the joining of the bones. This process is described in the article **JOINTS**.

Articulation, in speech, is clear and distinct utterance. The principles of articulation as taught in schools are briefly set forth in the well-known lines—

Speak clearly if you speak at all—
Carve every word before you let it fall;

and Shakespeare put into the mouth of Hamlet advice on the subject by which others beside players might profit:

Speak the speech, I pray you, as I pronounced it to you, trippingly on the tongue; for if you mouth it as many of your players do, I had as lief the town-crier spoke my lines.

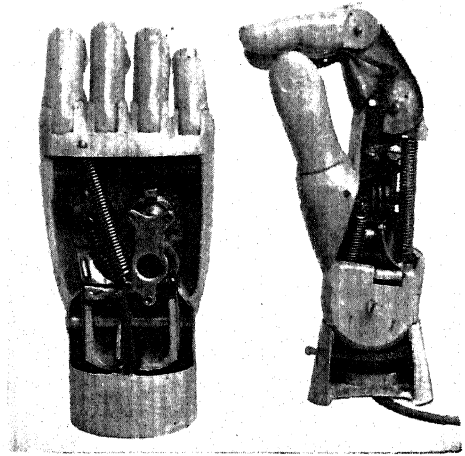
People who do not articulate clearly usually fail to bring out the sounds of the consonants in words, or certain syllables, as the *ing* in *exceedingly*. See **LANGUAGE**. K.A.E.

ARTIFICIAL FLOWERS. See **FLOWERS**, subtitle.

ARTIFICIAL LIMBS, limbs made to supply the place of those lost by accident or in war. From the very earliest days, those who have lost arms or legs have endeavored by artificial means to replace them, but it is only within recent years that the manufacture of limbs has developed into a science. Prior to the World War, such development had gone further in the United States than in any other country, but Europe's needs in this direction during the war led to notable perfection in the art of limb-making. As the cost of artificial limbs would be beyond the means of many of the maimed soldiers in the war, the various governments supplied them to those who suffered loss of arms or legs. The United States set the ex-

ample in this matter by supplying the maimed veterans of its wars with artificial limbs, renewable every five years. Artificial legs, arms, eyes, and even ears and noses, are now made with wonderful skill, both in Europe and America.

Artificial legs are usually made of strong, light wood, or aluminum, with joints at knee



MECHANISM OF AN ARTIFICIAL HAND

The wearer of such a device learns to use it with an efficiency which is quite remarkable.

and ankle, and with certain portions, such as the soles of the feet, of rubber. When amputation is necessary, surgeons carefully consider how best to fit the remaining stump of arm or leg to the requirements of an artificial limb. The stump leg never rests upon a solid support, but fits into the hollow portion, so that the weight of the wearer rests upon the sides of the stump. The artificial limb is attached by lacing a leather "corset" around the stump of the leg and by a belt around the waist. Sometimes a suspender is used, so that by a slight movement of the shoulder the knee joint can be operated and controlled. The wearers soon acquire the ability to balance and swing their legs from the hip, using the suspender control as need requires.

Arms are fitted at the shoulder, attached to a corset, or below the shoulder, with bands around the stump. Elbow joints and wrists which rotate are provided. With the aid of springs, which are controlled by shoulder movements, the hand can be made to perform many duties, such as holding a pen or clasp ing a piece of paper. Sometimes a hand has a socket in which a knife or fork can be held. The arm is built to carry seventy-five pounds, although it is capable of holding 140 pounds.

The making of artificial eyes requires great care, and is a delicate operation. A shell of

glass is molded and made to the exact size required; then pieces of colored glass are worked into it in exact imitation of the eye it is to match, even to the tiniest blood vessels. An ear is made of *papier-mâché* or metal, painted in natural colors and supported in its place by a spring passing over the head. An artificial nose is molded of *papier-mâché*, and is held in place by spectacles or clamped to the remaining stump.

In the manufacture of all artificial limbs, the greatest care is taken to ensure a perfect fit, as on that depends entirely the comfort, and often the health, of the wearer. A limb well fitted enables the wearer to use it with a good degree of satisfaction.

ARTIFICIAL SILK. See RAYON.

ARTILLERY, *ahr til' ur iē*, the name given to guns which are so large they must be mounted or fastened on platforms, and cannot be carried and fired by hand. The term is also applied to the troops who operate such guns. Since the fourteenth century, when artillery was first introduced into warfare, every war has led to alterations in the type of guns and the tactics governing their employment. In the World War greater reliance than ever before in history was placed on artillery, and after the very early stages, the conflict developed to a great extent into contests between big guns.

Modern artillery can hardly be divided into *mobile* and *immobile*, as was the previous custom. Big guns are now brought into action and moved from place to place in such a manner as to prove that no artillery is immobile. What is regarded as strictly mobile artillery consists of *field* and *horse artillery*, in batteries of four or six guns which can keep pace with marching troops and go into action with them.

Field Artillery. All modern armies employ in connection with their infantry, quick-firing,

but motor vehicles are used wherever possible, and they draw whole batteries of guns.

Horse Artillery. The rapid motion of guns with mounted troops is naturally of the greatest importance when advancing or retreating. The artillery must maneuver rapidly to cover the troops, and also, in case of need, to extricate itself from any difficulty. In the United States, the guns are the same as those of the field artillery, and fire shells varying in weight from twelve to fifteen pounds. The cannoneers, however, are mounted, riding behind the gun carriages instead of on the carriages themselves; hence the name horse artillery.

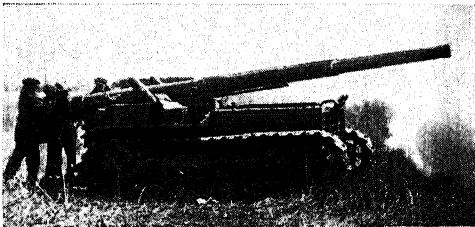
Heavy Artillery. For siege purposes or for reducing forts and earthworks, very large guns are used. The comparative ease with which large guns can be moved was one of the outstanding features the World War developed. Against the huge shells, weighing sometimes more than a ton, fired from guns with a caliber of seventeen inches, and a range of nearly twenty miles, the most scientifically constructed forts cannot stand. Masses of concrete and steel are quickly leveled to the ground, and gaping chasms are dug in earthworks and trenches by these terrible weapons. The *howitzer*, which proved so effective early in the World War (see *HOWITZER*), is now regarded as one of the most deadly of modern weapons.

The 6-inch howitzer fires a shell weighing from 122 to 200 pounds, and has a range of four miles. With its carriage, it weighs 9,500 pounds. Until the introduction of the German 17-inch howitzer, the 9.4-inch howitzer was considered the largest-size gun which combined ease of movement and general efficiency. However, each of the powers engaged in the war endeavored to outclass the others in size and range of its guns and projectiles.

In 1918 the Germans shelled Paris with a mammoth gun of unknown dimensions at the time, from a distance of 76 miles. Its projectiles reached 15½ miles above the earth.

The "75." One of the most effective of all modern guns is that used by French artillery, and known as the "75 millimeter" or "75." In inches, its caliber is 2.9, and it fires shell or shrapnel weighing twelve and fifteen pounds. In range, accuracy, and speed of fire, and in destructiveness it proved itself superior to any other weapon of a similar size.

The Mortar. This is the type of gun in the World War that so quickly reduced the forts of Liège, Antwerp, and Przemysl. It is exemplified by the 16-inch Krupp mortar and the Austrian 12-inch mortar, called a Skoda, in honor of its inventor, which fires a shell weighing 858 pounds. This mortar fires at a greater angle of elevation than any other gun, and has a range of eight miles. At a distance of seven and one-half miles, firing at an invisible object, German gunners pierced the roof of an Antwerp

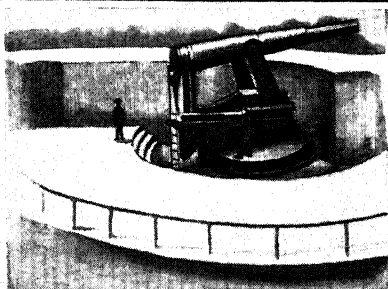


A SIX-INCH GUN

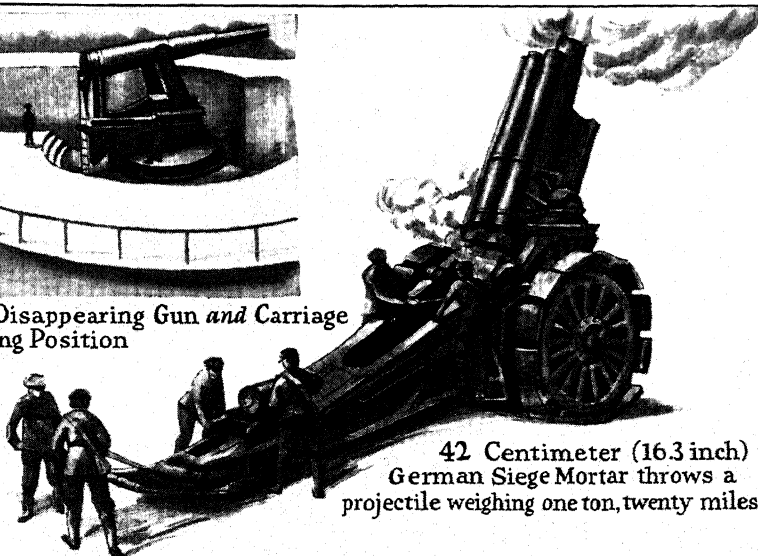
Photo: P & A

breech-loading guns firing shells weighing from thirteen to eighteen and one-half pounds (see *AMMUNITION*). These guns are capable of firing from ten to twenty aimed shots per minute, and have a range varying from three and one-half to four and one-half miles. The weight of the field gun is over a ton. Ordinarily, each gun in the field artillery is drawn by six horses,

MODERN ARTILLERY



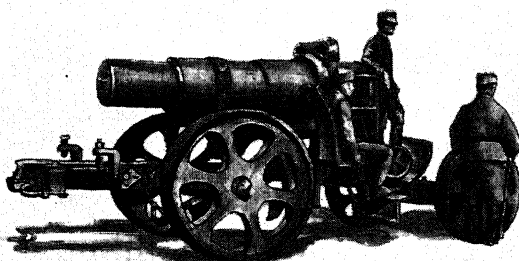
10-inch Disappearing Gun and Carriage
in Firing Position



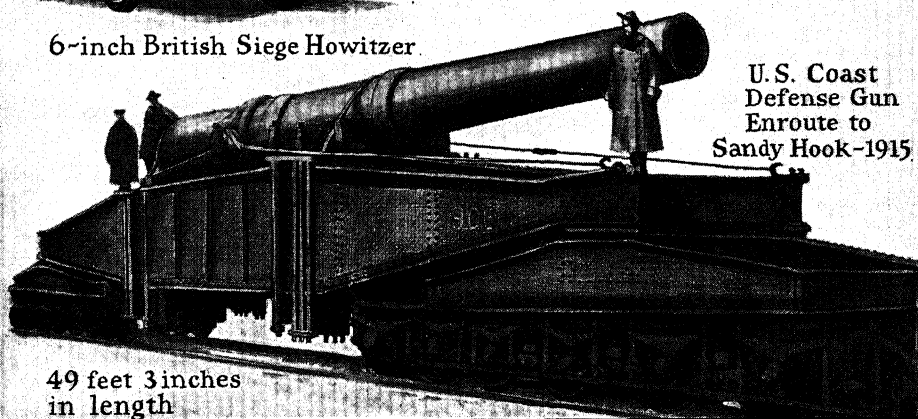
42 Centimeter (16.3 inch)
German Siege Mortar throws a
projectile weighing one ton, twenty miles



6-inch British Siege Howitzer.



12-inch German Siege Gun



U.S. Coast
Defense Gun
Enroute to
Sandy Hook-1915

49 feet 3 inches
in length

fort at the first attempt. The Skoda mortar is mobile and can be removed in forty minutes, while the dismounting and removal of the 16-inch mortar from its necessary bed of concrete is a work of hours. The 12-inch mortar is lowered to a horizontal position to be loaded and then swung to the angle of elevation desired. It can fire one shot per minute, though the usual speed is only one shot every two minutes. A crew of 200 men is needed, and it requires three 100-horse-power motor trucks to transport it.

Anti-aircraft Guns. The important part played by airplanes and dirigible balloons in modern warfare brought into use during the World War a new type of gun. Anti-aircraft guns are mounted on wheeled carriages or on automobiles, and are capable of rapid firing, rapid adjustment of sights, and quick changing of the angle of elevation. Machine guns firing rifle bullets are effective against aircraft when flying low, but heavier guns firing one-, two-, and three-pound shells are more to be relied on. The ideal gun to resist aerial attacks, one firing a shell in an absolutely vertical line, has not yet been evolved, the nearest approach being a gun firing at an elevation of seventy-five degrees. Airships could not possibly rise above the range of big guns firing shells vertically.

Coast and Fortress Artillery. Guns for permanent defense of coast or towns are mounted on carriages and platforms capable only of movements to bring the gun into position for firing over the defenses, or through embrasures, and for lowering, so that loading may be done while completely under cover. Such guns are of large caliber and long range, so war vessels may not approach close enough to them to inflict damage before themselves being under fire. For other guns used in modern warfare, see NAVY (Naval Guns); HOWITZER; MACHINE GUN.

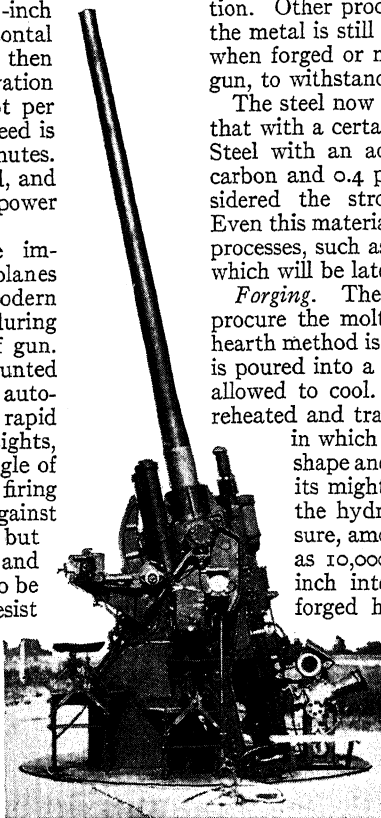
How Big Guns Are Made. The use of steel in the making of big guns is of comparatively recent origin. A modern shell, fired from a gun made only a few years before the employment of hardened steel, would burst the gun and do more damage to those firing it than to the enemy. Modern weapons, however, are made to withstand a pressure of at least twenty tons

to the square inch of surface, and bursting is of very rare occurrence. Bessemer steel was one of the first and most important steps in the production of modern weapons of destruction. Other processes have followed by which the metal is still further hardened, enabling it, when forged or molded into the form of a big gun, to withstand the pressure of explosives.

The steel now used is of the carbon type, or that with a certain proportion of nickel added. Steel with an admixture of four per cent of carbon and 0.4 per cent of nickel is now considered the strongest possible combination. Even this material undergoes further hardening processes, such as annealing and oil hardening, which will be later described.

Forging. The first process is naturally to procure the molten steel. For this, the open-hearth method is employed. The molten metal is poured into a mold of the required size and allowed to cool. The ingot thus produced is reheated and transferred to a hydraulic press, in which it is forged to the required shape and size. The steam hammer with its mighty blows has been superseded, the hydraulic producing greater pressure, amounting sometimes to as much as 10,000 tons. Guns of more than 8-inch internal diameter, or bore, are forged hollow, over a tube cooled by running water. When the forging is complete, the gun is heated again and allowed to cool gradually, usually being placed in warm sand; this process is termed annealing. A further hardening process consists of heating the metal to 1,600° F. and plunging it quickly into a bath of oil. The forged gun is placed on a lathe, and the barrel is bored to the required size. The rifling, a series of curves or partial curves, is cut by machinery so delicately adjusted that the cutting may be judged to the thousandth part of an inch.

The Jacket. The foregoing processes refer only to the inner barrel, or tube, of the gun. Next comes the process of fitting this tube with a jacket or covering to give it sufficient strength to meet its required test. An outer tube is forged of such a size that, when expanded by heat, it will fit over the inner tube. As it cools, the jacket contracts and grips the inner tube as tightly as though both were forged from one piece of metal. The completed gun is again placed in a lathe, when extra bands are shrunk on to strengthen it still further. The gun is then ready for its final testing for accuracy of bore, the breech mechanism is added, and the gun is ready to be mounted.



ANTI-AIRCRAFT GUN

This gun was officially adopted by the United States army in 1928. It is said to be the longest-barreled shooting-iron of its size that was ever made. The gun fires a projectile weighing thirty-three pounds almost straight upward to an altitude of 12,000 yards—nearly seven miles.

The Breech. The breech of the cannon is a piece of mechanism which opens and closes the end of the gun in which the charge is inserted. When closed, the breech, or breech block, must have sufficient strength to withstand the shock of the bursting charge and yet be so easily and quickly opened and shut as not to interfere with the rapid working of the gun. The modern form of breech block is fitted with what is termed an interrupted screw, being divided into twelve sections. The breech is hinged, and when pushed forward into position, one-twelfth of a turn engages three-fourths of its surface in the threads grooved in the breech of the gun. One-twelfth of a turn disengages the breech block, which is swung open, bringing with it the exploded cartridge, and, in some cases, at the same time raising another charge into position to be inserted in the breech.

Related Subjects. The reader is referred in these volumes to the following subjects:

Gunpowder	Shell
Howitzer	Shot
Machine Gun	Shrapnel
Projectile	Smokeless Powder

ARTOIS, *ahr twah'*, a French province where flowing wells were first popular. See **ARTESIAN WELL**.

ARTS AND CRAFTS. Before the development of the factory system, which has proved so detrimental to the expression of artistic impulses and individual taste, there was widespread interest in wood carving, metal work, spinning and weaving, pottery, and other arts. About the middle of the nineteenth century, public interest was revived in these handicrafts, and in 1888 an Arts and Crafts Exhibition Society held its first show in London. That date marks the formal beginning of the "arts and crafts movement," typifying the revival of artistic, individual workmanship as opposed to labored, uniform designs turned out by factories.

The men who inspired and led this new movement in art—Carlyle, Ruskin, William Morris, Walter Crane—believed that all work should produce a useful, artistic result. Art for them was not confined to oil paintings in gilt frames, but included all the countless products of human hands. "Real art," said Morris, "is the expression by man of his pleasure in labor." Ruskin voiced the same idea when he said that there are three tests of work; it must be honest, useful, and cheerful. To rescue public taste from the cheap imitations of foreign models, to encourage sound workmanship and raise the handicrafts to their rightful position as arts; these were the aims of the leaders.

The success of the movement was due chiefly to the artistic and practical skill of William Morris, who mastered in turn the details of every craft in which he became interested; "he was painter, designer, scribe, illuminator, wood-

engraver, dyer, weaver, and finally, printer and paper-maker." The work of William De Morgan in pottery, and of T. J. Cobden-Sanderson and his pupils in bookbinding, is also noteworthy. Thousands of workmen, influenced by the example of such leaders, now realize the dignity of work and its artistic possibilities, and nearly every community has its enthusiastic arts and crafts devotees.

The arts and crafts movement was not confined to England, but spread to other European countries and to America, where one of its leaders was Elbert Hubbard, founder of the Roycrofters, an organization of craftsmen at East Aurora, N. Y., engaged in the production of simple but beautiful furniture, books, jewelry, and metal and leather work.

"Have nothing in your houses which you do not know to be useful or believe to be beautiful" was Morris's ideal. He would prefer a single beautiful picture, even though cheap, to a dozen ugly or indifferent prints. The fitness of an object for its purpose, the sincerity and honesty of its workmanship, not the price or fashion, were new tests of art. See **MORRIS, WILLIAM; FACTORY AND FACTORY SYSTEM**.

ARTSYBASHEV, *art sib ah shef'*, **MIKHAIL**. See **RUSSIAN LITERATURE**.

ARUM, *a' rum*, the common name of a family of plants of peculiar flower structure. The showy, lilylike part which is usually called the flower is not really a flower at all, but is known as the *spathe*, while the flowers themselves, tiny and inconspicuous, are massed in a spike about a central shaft, or *spadix*. Many



Photo: Visual Education Service

ARUM

The water arum in blossom. In the inset is seen a blossom in cross section.

varieties are cultivated in hothouses on account of their beauty. The stems and leaves contain a bitter juice, and the bulbs from which the

plants spring contain a starch which may be used for food. The scientific name of the family is *Araceae*. For members of the family described in these volumes, see *CALLA*; *JACK-IN-THE-PULPIT*. B.M.D.

ARUNZEBE, *a roon' ze be*, son of Shah Jehan, Mongol ruler. See *SHAN JEHAN*.

ARYAN, *ahr' yan*, commonly, *air' i an*, meaning *lord of the soil*, is the name given to that branch of the human race whose members are supposed to have lived originally in Central Asia, east of the Caspian Sea and north of the Hindu Kush Mountains. They are also called the Indo-European and Indo-Germanic race. With the exception of the Turks, the Magyars of Hungary, the Basques of the Pyrenees, and the Finns of Lapland, all the nations of Europe sprang from this branch of the human family. Centuries ago the Aryans became the ruling race of India, and their ancient language was Sanskrit. All modern languages sprang from the speech of these people. See *LANGUAGES OF THE WORLD*. C.W.

ASAFETIDA, *as a fet' i dah*, also spelled *ASAFOTIDA*, is a gumlike drug having a powerful, disagreeable odor much stronger than that of garlic. It is employed in medicine to prevent spasms and to calm mild attacks of hysteria. In the latter case, it is sometimes said, the patient finds the medicine so extremely distasteful that he controls himself and thus a second dose is unnecessary.

Asafetida is obtained by drying the milky juice from the roots of a large plant of the parsnip family that grows in Asia. It is found on the market most commonly in the form of small, brownish lumps. In spite of its disgusting odor, asafetida is used in South America, India, Persia, and France as a seasoning. Years ago people used to hang a little bag containing asafetida about the neck as a protection against scarlet fever, but this custom has gone the way of many other superstitions.

Classification. The plant from which the drug is obtained belongs to the family *Apiaceae*. Its botanical name is *Ferula foetida*.

ASBESTOS, *as bes' tahs*, the name applied to certain fibrous silicate minerals remarkable for their resistance to attacks of fire, acids, and

time. There are two kinds of asbestos in general use; the best is a fibrous variety of serpentine, obtained chiefly from Quebec; the other is a silky type of amphibole imported from South Africa. Both have smooth, separable fibers, sometimes delicate, flexible, and elastic, sometimes stiff and brittle.

Asbestos is heavy in its crude state, but the fibers can be made as light as down after they are treated for commercial uses. Separating the asbestos fibers from each other gives a snowy mass of what might be termed mineral wool. Three or four processes of carding bring this material into shape to be woven into cloth, packing, or whatever form may be desired. Fibers used in weaving vary in length from two inches to five or six feet.

Pure asbestos-cloth curtains form one of the safest barriers against fire in theaters. Most theaters are required by law to provide asbestos curtains or hangings of some other fireproof material. The best brake-linings for automobiles are made of long-fiber asbestos.

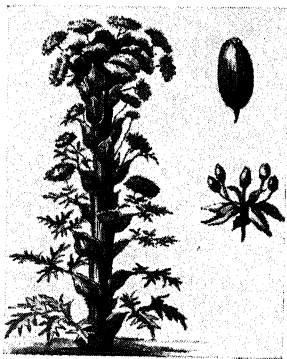
Asbestos is also used as a covering for steam-pipes, to provide against loss of heat, and as a cement it is used for hot-blast pipes and fire-heated surfaces. Compressed asbestos fiber board may be employed for flooring and wood-work in general, and when so used may be stained, polished, and finished the same as wood. Asbestos is quite frequently used for upholstering and for carpets; a peculiarity of the latter is that the longer such a carpet is used the tougher it becomes, although it does not improve in appearance. Asbestos is also ground fine and used in paints. Roofs are made by treating strong canvas with a combination of asbestos and felt. Mittens for iron and glass workers are made from asbestos yarn. Asbestos soldering blocks are used by goldsmiths. In combination with rubber, it is much employed as an electrical insulator. Asbestos cloth is utilized for acid filters in all sorts of chemical processes, for the reason that no acid will attack or dissolve it.

There is a small production of asbestos in the United States, but that country secures most of the raw material used in manufacture from Canada, the chief source of the world's supply. Quebec alone supplies three-fourths of the total output from all countries. A.N.W.

Antiquity of Asbestos. The name *asbestos* is from a Greek word meaning *unburnable*. The ancients knew of this mineral, and sometimes wove the fibers into handkerchiefs; asbestos shrouds were used for bodies that were cremated, in order to keep the ashes of the latter intact. According to tradition, Charlemagne had an asbestos tablecloth that was cleaned by being placed in flames.

[See the article *QUEBEC* (Sources of Wealth).]

ASBURY, FRANCIS (1745-1816), famous as the "Father of American Methodism" and as the first bishop of the Methodist Episcopal



ASAFETIDA

The plant, flower, and fruit.

Church to be ordained in the United States. He was born near Birmingham, England, was converted to Methodism at the age of thirteen, and in 1771 went to America as a missionary. Through his efforts, the membership of the Church rapidly increased, and in 1784 John Wesley appointed him bishop. This appointment was a little later ratified at Baltimore by a conference which marked the real beginning of the Methodist Episcopal Church in America. To the end of his life, Asbury worked with untiring zeal for the Church, and during his ministry preached over 16,000 sermons. See **METHODISTS; WESLEY, JOHN**.

ASBURY PARK, N. J. See **NEW JERSEY** (back of map).

ASCENSION DAY, a holy day of the Episcopal and Roman Catholic churches, set apart to commemorate the ascension of Christ, and ranking with Christmas, Easter, and Pentecost. It falls on the fortieth day after Easter, or ten days before Whitsunday, when the day of Pentecost is observed, and always occurs on Thursday. It is often called *Holy Thursday*.

ASCENSION AND DECLINATION OF STARS. See **RIGHT ASCENSION AND DECLINATION OF STARS**.

ASCETICISM, *as set' e siz'm*, the practice of self-denial and bodily suffering, imposed for the purpose of gaining spiritual strength. The term commonly refers to the acts of some of the early Christians, whose fastings and self-inflicted tortures were often prolonged and severe. But asceticism had been preached and practiced from times far earlier. The word itself was first applied to the training undergone by Greek athletes preparing for a contest. Fasting was frequent among Old Testament peoples, and self-denial must have some connection with sacrificing to deities, a custom of all primitive races. The monks of the Middle Ages were ascetics, and so to a certain extent were the Puritans. They first gave up all the attractions of the world—money, power, and family life. The Puritans denied themselves luxuries in dress or amusement and made life a serious business, but did not withdraw from the world and its normal activities.

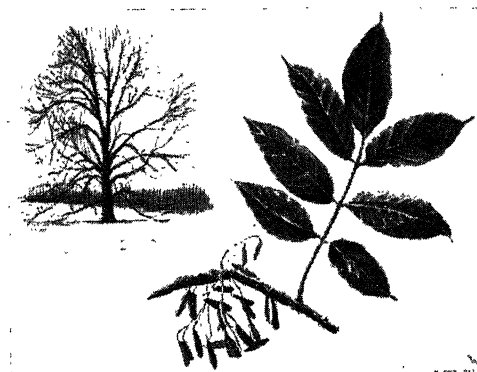
ASCIDIAN, *a sid' i an*. See **SEA SQUIRTS**.

ASEPTIC, *a sep' tik*, **SURGERY**. See **ANTISEPTIC**, subhead.

ASGARD, *as' gahrd*, to the ancient Scandinavians, was the home of the gods, as Olympus was to the Greeks. Here each god had his palace, and here was the radiant hall in which their councils were held, presided over by Odin. But the Scandinavians believed that sooner or later evil would triumph over the great gods, and that all the bright dwellings of Asgard would be destroyed. See **ODIN; OLYMPUS; VALHALLA**.

ASH, the common name of a genus of deciduous trees belonging to the olive family.

The more than fifty species are found chiefly in Europe and North America. The flowers are small, and they appear before the leaves;



THE ASH TREE

The form of the tree, also shape of leaves and appearance of fruit.

the fruit is a winged seed vessel, with one seed. The leaves appear late and fall early.

The *white ash* is a beautiful shade tree, and is a favorite in parks. It is also one of the most useful of trees, for its wood is hard and tough, and it is valuable in the construction of wagon wheels and for turning, besides being excellent fuel. The *black ash* is found in low, wet land, and can be recognized by its almost black bark. Its wood is easily split into thin pieces, and is extensively used in the manufacture of hoops, staves, and baskets. The *blue ash* is so called because its bark turns water blue. Several trees popularly called ash do not belong to the ash botanically. See **MOUNTAIN ASH; PRICKLY ASH**. G.M.S.



Photo: Visual Education Service

RED ASH BLOSSOMS

Scientific Names. The ashes proper belong to the family *Oleaceae*. The white ash is *Fraxinus americana*; the black ash is *F. nigra*, and the blue, *F. quadrangulata*.

ASH, OR ASHES, the mineral substance that remains after any material has been burned. The plural form of the term is usually applied to the mineral obtained on burning wood, coal, or other fuel. Since any ash contains the unburnable elements present in the substance burned, such as phosphorus, calcium, iron, potassium, etc., the ash left from the complete burning of food gives a basis for determining the mineral elements present in our food prod-

ucts. Thus, scientists are enabled to tell us that milk is an important source of calcium; iron is found abundantly in spinach; eggs contain iron and phosphorus.

From an economic standpoint, ashes are valued as fertilizer and insecticides. Also, ash of seaweed furnishes iodine, and that of wood is a source of potash. See FERTILIZER. A.N.W.

Related Subjects. The reader is referred in these volumes to the following articles:

Fertilizer	Nutrition (Mineral Sub-
Insecticides	stances in Food)
Iodine	Potash
Kelp	Seaweed

ASHANTI, a *shan' tee*, a colony in West Africa, attached to Great Britain in 1896, inland from the Gold Coast, and inhabited chiefly by warlike negroes. It has an area of 23,000 square miles and a population of about 420,000. On the west, it is bounded by the French Ivory Coast territory, and it is surrounded on all other sides by British West African possessions. The chief town is Kumasi, with about 20,000 inhabitants.

At one time, Ashanti was the greatest slave market in the world, slave traders from all parts of Africa meeting at Kumasi to dispose of their captives. Abolition of this traffic by the British authorities led to the introduction of peaceful pursuits. Cocoa and rubber are extensively grown, and there is considerable gold mining. A railway runs from the coast to Kumasi, opening up important mining and agricultural districts. The natives in many parts adhere to the use of cowries and other shells for currency (see COWRIE).

Ashanti is administered by a British resident commissioner, who is responsible to the governor-general of the Gold Coast (which see).

ASHBURTON, *ash' bur t'n*, ALEXANDER BARING, Lord (1774-1848), an English financier and diplomat, best known as one of the negotiators of the Webster-Ashburton Treaty (which see), concluded between Great Britain and the United States in 1842. The interests of the latter country were in the hands of Daniel Webster. Ashburton was appointed to represent England in the negotiations because

of his training in mercantile affairs and his wide knowledge of American institutions and ideas. He had succeeded his father as head of Baring Brothers & Company, in 1810, and in the management of this London mercantile firm he came in contact with trade and business interests in both the United States and Canada. Another point of contact resulted from Ashburton's marriage, in 1798, to Miss Anne Bingham, of Philadelphia, the daughter of a United States Senator from Pennsylvania.

ASHEVILLE, N. C. See NORTH CAROLINA (back of map).

ASHKELON, *ash' kelahn*. See PHILISTINES.

ASHLAND, KY. See KENTUCKY (back of map).

ASHLAND, WIS. See WISCONSIN (back of map).

ASHLAR. See BUILDING STONE.

ASH-LEAVED MAPLE. See BOX-ELDER.

ASHOKAN RESERVOIR. See AQUEDUCT (Catskill Aqueduct).

ASHTABULA, O. See OHIO (back of map).

ASH'TERAH, consort of Baal (which see). See, also, CANAANITES.

ASH'TORETH. See ASTARTE.

ASH WEDNESDAY, the first day of Lent. It derived its name from the practice in the early Christian Church of doing penance by appearing in public "clad in sackcloth and ashes." In medieval times, it became customary to preserve the ashes obtained by burning the palms after Palm Sunday (which see), and to sprinkle them on the heads of penitents. In the Roman Catholic Church to-day the priest blesses the ashes on the altar and places them on the foreheads of the clergy and congregation. As he touches each forehead, he intones in Latin: "Remember, man, that thou art dust, and unto dust thou shalt return."

The Protestant Church in Germany does not observe the day; and while it is celebrated in the Church of England and the Protestant Episcopal Church in America, the ceremony which gave the day its name has been greatly changed and simplified during the past hundred years. See LENT.



ASIA, the most extensive land mass on the globe, comprising more than one-third of the entire land surface. What the name means is not known, but it is held by some authorities to be derived from an Assyrian

word meaning *the rising sun*, and thus to signify the East, just as the word *Europe* is believed to denote the West, or *the setting sun*. The area of Asia, not far from 17,250,000 square miles, is one and a half times as great as that of Africa,

the second largest grand division; five times that of Europe, exclusive of its islands; and greater than that of North America and South America combined. Its estimated population of 920,000,000 is more than half that of the whole world, yet there are within it vast stretches that are uninhabited, and other tracts where the population is but five to the square mile. To offset this, there are other parts of the continent where people are crowded together as they are nowhere else in the world.

Political Divisions. A large part of Asia is under the control of European governments, but there are a number of independent countries. These are (1) the Chinese republic, which includes China proper, with some rather unstable claim to Manchuria, Mongolia, Sinkiang (Chinese Turkestan), and Tibet; (2) Japan; (3) Siam; (4) Persia; (5) Oman, Hejaz, Yemen, Nejd, in Arabia; (6) Nepal, and a number of small states in Arabia and in the Himalayas; (7) Turkey, comprising most of Asia Minor, or Anatolia.

The independent country of Afghanistan has been politically free since 1921; Baluchistan has been largely acquired by the British. Korea was independent until 1910, when it became a Japanese province with the name Chosen.

Armenia is a Soviet republic, a member of the Transcaucasian Socialist Soviet Republic, under Russian influence. Transjordan, Syria, and Palestine, wrested from Turkey after the World War, are destined to be independent, but are now under English and French mandates.

The interests of European nations in Asia, other than those named, are as follows:

France. Pondicherry and four minor possessions in India; Indo-China, including Annam, Cambodia, Cochin-China, and Laos; and Kwang Chau Wan, leased from China.

Former German Interests. Near the beginning of the World War, Germany lost Kiaochow, which it had leased from China.

Great Britain. Aden colony and protectorate; Bahrein Islands (in the Persian Gulf); Ceylon; Cyprus; Hong Kong and adjoining leased territory; India; Straits Settlements; Federated Malay States protectorate; and Weihaiwei, leased from China.

Portugal. Macao, in China; Goa and two minor possessions, in India.

Russia. Siberia; Transcaucasia; Transcaspia; and the former states of Bokhara and Khiva, now the Socialist Soviet Republic of Uzbek.

[The leading countries, rivers, and mountains named in this article are described under their titles in these volumes, and for detailed accounts the reader is referred to them.]

The Coast. Three oceans, the Arctic on the north, the Pacific on the east, and the Indian on the south, bound this great continent on three sides, and on the west the boundary is

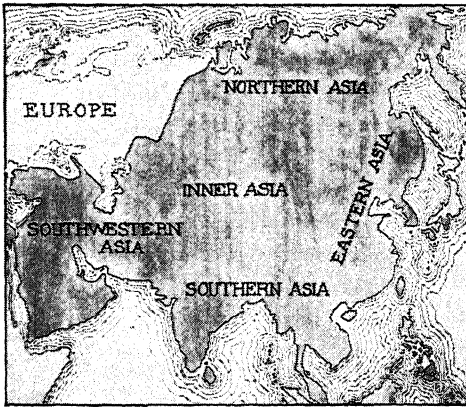
formed by the Mediterranean, Caspian, Black, and Red seas, with Europe, which is really but a peninsula of the Asian land mass, stretching away to the westward. Only the narrow Bering Strait separates Asia from North America on the northeast; the two continents at this point are only thirty-six miles apart.

All of the coasts have deep indentations, but those on the north are but estuaries at the mouths of rivers; on the east and south there are great seas—to the east, Bering Sea, the Sea of Okhotsk, Sea of Japan, Yellow Sea, and South China Sea, and to the south the Bay of Bengal and the Arabian Sea, with its extension, the Persian Gulf. The coast line of Asia is almost 35,000 miles, little less than twice that of Africa. Along the eastern coast, stretching off to the southeast, lie numerous islands and chains of islands, some of which are of the utmost importance—the islands of Japan, the Philippines, Borneo, Sumatra, Java, New Guinea, and the thousands of small islands which comprise the Malay Archipelago.

A Land of Extremes. Asia is the land of the most extensive plains, the greatest plateaus, and the highest mountains in the world. There are also the sharpest physical contrasts that are found anywhere in the world. Its highest peak, Mount Everest in the Himalayas, 29,141 feet, is more than twice as high as Pike's Peak, while its deepest depression, the Dead Sea in Palestine, is 1,290 feet below sea level. On the steppes of Western Siberia, a temperature of 90° F. below zero is by no means uncommon, and the average winter temperature is far lower than that in the polar regions; but in parts of Arabia the heat is extreme, and Aden, cut off by sheltering cliffs from breezes, is the hottest town in the world, all the year round, though a higher temperature has been recorded in North Africa (see TEMPERATURE). Sharp as are the Asian contrasts, there is nothing remarkable about them when the vast extent of the continent is considered.

How the Continent Is Divided. In Asia the great mountain systems make barriers which have proved far more effective in keeping people from crossing from one part of the continent to another than have the Rocky Mountains in North America, for instance; for dwellers in North America have been determined to possess all the land, and have consequently pushed on over the mountains. Climate and living conditions may differ with the varying locations, but the same civilization exists on both sides of the American Continental Divide. The Asiatic peoples, however, for the greater part have not been progressive enough to attempt to overcome such obstacles; in the central Himalaya section the task is beyond possibility; within recent years four people have lost their lives in the endeavor to reach the top of Everest.

Each nation or group of nations lives within its own boundaries, holding to its own manners and customs, differing decidedly from other nations just over the mountains. Invasions



PHYSICAL DIVISIONS

This map makes it easy to understand the description of the land surface of the vast continent.

there have been at all times in the history of Asia; India, for example, was for centuries the prey to any conquering hordes that might sweep over the mountains; but these invaders either came and withdrew, leaving no trace, or settled in the new land and were absorbed by its people. They never established any relations between the two sides of the great barrier.

The mountains of Asia are not a well-marked chain, like that which runs through Western America, but no other mountain systems can vie with them in height and in grandeur. The center of the system, if anything so definite as a center can be claimed for these irregular chains, is the Pamir plateau to the north of India—the “roof of the world,” as dwellers in that region love to call it. This is not just a great flat table-land, but a series of mountains and valleys so elevated that the bottom of the deepest valleys is about 11,000 feet above sea level. And over all these, lofty peaks tower to heights of more than 25,000 feet, as high above the valley floors as Pike’s Peak is above sea level.

Branching from the Pamirs, mountain ranges extend in various directions. To the northeast is Tian-Shan range, then the Altai Mountains; and beyond these the Yablonoi and the Stanovoi mountains, ranges of lesser height, continue the system to the shores of the Pacific. Southeast from the Pamirs are the Karakorum Mountains and, loftiest and most impressive of all, the Himalayas, in which is included Mount Everest; while to the west of the “roof of the world” branches off a great system which comprises the Hindu Kush, the Elburz, and the Caucasus; the latter forms part of the physical boundary between Europe and Asia.

Lesser ranges rise in various parts of the continent—ranges which would stand out as vast and impressive in a land of less lofty plateaus; but the mountains described above are those which separate Asia into regions so distinct that passage from one to another is difficult.

So definite and isolated are these divisions that it is easier to treat of their geography, their population, and their history separately than to consider the continent as a whole. These divisions, roughly speaking, may be called (1) Northern Asia; (2) Inner Asia; (3) Eastern Asia; (4) Southern Asia; (5) Southwestern Asia.

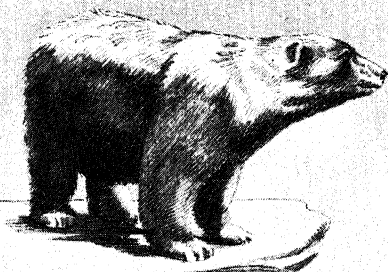
Northern Asia. This is the vastest of these regions, with 6,660,000 square miles—an area almost as great as that of Canada and the United States combined.

The Land. Northern Asia has great rivers, the Ob, the Yenisei, and the Lena, which in size rank not far below those of North America; and wide-stretching plains with which the Mississippi Valley cannot compare in extent. But the difference between Canada and the United States and this Asiatic region, consisting of Siberia, Sin-Kiang, and Transcaspia, is incalculable. It is not simply a question of development. Northern Asia will never, in all probability, merit or repay even a small part of the energy which has made the United States and Canada what they are. In the southern part of the region, in Transcaspia and Sin-Kiang, lack of rainfall results in extensive regions that are absolutely desert in character, supporting only half-savage nomad tribes or an occasional group which makes its home on an oasis. See **NOMAD LIFE**.

To the northward, as the rains become more abundant, occurs a grassy region where horses and cattle find good pasturage, and still farther north there is sufficient moisture for the raising of temperate-region crops, especially the grains. Through this region has been built the longest continuous railroad in the world, the Trans-Siberian Railroad (which see); this section alone seems now capable of high development. Unbroken forests stretch from the northern limit of this region, reaching almost to the tundras of the Arctic region. The lower parts of the rivers remain frozen long after the ice has disappeared in the upper courses. As a result, almost the whole northern coast region is a flooded morass uninhabitable and impenetrable. This region, in which nothing but a coarse moss grows, is the tundra belt. The whole land presents an unspeakably dreary and inhospitable appearance.

Its Inhabitants. Even the stolid Asiatics, who are accustomed to misery and to scanty food, find most of Northern Asia too desolate and too unproductive to afford them decent habitation, and the region, as a whole, is

IMPORTANT ANIMALS of ASIA



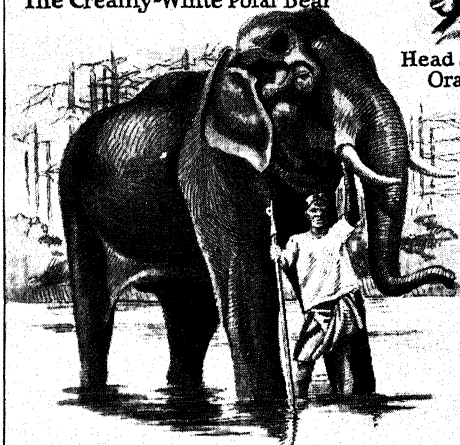
The Creamy-White Polar Bear



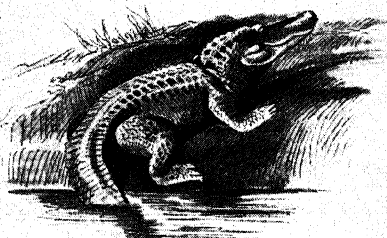
Zebu—A Gentle Beast of Burden



Head of
Orang-Utan



Asiatic Elephant and Attendant



Crocodile of India



Many-Colored Golden Pheasant



Bactrian Camel—
The Ship of the Desert



Rhinoceros



Tiger—The Fiercest of the Cats

sparsely populated. In the most northerly inhabited belt are tribes belonging to the Mongol, or yellow, race. Of these, the Samoyads are best known. They resemble the Lapps of Northern Soviet Russia and Finland, and also the Eskimos of the American continent. Soviet Russia, to which much of the region belongs, has sent out many colonists, but these have almost without exception settled in the grain-growing country (see *SIBERIA*). The few exceptions are hunters and trappers, who gain their livelihood by selling the pelts of the fur-bearing animals with which the great forests abound. Neither the Russian immigrants, the wandering tribes of Turkish stock, nor the Mongols to the east have ever made any attempt to develop the mineral resources of the region, and it cannot be told whether these are great or small.

Centuries ago, before Russia itself was well established, adventurers made their way from that new empire into the vast plains to the east, for the connection between the two continents is here very close. The scattered inhabitants offered no resistance, nor did any of the other European powers except Turkey, which resisted weakly, and from the sixteenth century Russia continued to assert its right to the territory more and more firmly.

Inner Asia. This region, with an area of two and one-half million square miles, includes Tibet, Mongolia, Sin-Kiang, and Chinese, or East, Turkestan. Nearly all of this region is arid; much of it is a desert, with intensely cold winters, very hot summers, and terrific sandstorms. About all the rain that falls comes in the form of cloudbursts. Theoretically, China is supreme over all this territory, but practically, the Chinese hold on it amounts to almost nothing. Russia is far more influential in all parts of the region except Tibet, where England is the dominant nation. Save as barrier states between north and south, these provinces are of no great value to any country, for they have not even the possibilities of the plains of Northern Asia. Sloping down from the towering Himalayas, the plateau of Tibet is far too high and too cold to permit much agriculture, and the lower regions are so shut in by mountains that they never receive any rain.

Minerals there are in abundance, especially gold, but the people are too unprogressive ever to have made much effort to secure it. The population is even more sparse than in Northern Asia, for no country has sent into Inner Asia the thousands of colonists that Russia has given to that northern region, and in all the 2,500,000 square miles there are but 4,500,000 inhabitants. Many of these depend for their support not on the products of the soil, as do the people of more favored regions, but upon certain animals. In the lowlands of Sin-Kiang, the Bactrian camel is the chief wealth of the

region, and above, in high Tibet, the yak is what the reindeer is to the tribes of the Siberian plain—almost their sole support, for it is too cold there for horses to flourish.

If a line be drawn from the central section of Northern Asia in a general southwesterly direction, it will mark a continuous succession of deserts, which join the Sahara in North Africa.

Eastern Asia. Far more important than either of the regions discussed above is this third division, which includes China proper, Japan, Korea (or Chosen), Manchuria, Indo-China, and Siam. Quite unlike the other two, it has over large sections a very dense population—few places in the world are more thickly settled. Its area is 2,600,000 square miles, its population about 450,000,000. Thus, with an area little more than two-thirds that of Canada, it has a population nearly sixty times as great.

The Land and Its Resources. This density of population proclaims one great economic fact—practically all the land must be utilized. And so indeed it is. There are no great forests given over to wild animals; no vast plains where cattle graze; no deserts where nothing but a camel can live. From the northern part of China, with its cold winters and its hot summers, to Siam, with its tropical climate, there is everywhere enough rain for agriculture, for all the moisture which the great sea winds bring is forced out before these winds cross the mountains to the interior. While that fact means desert conditions for Inner Asia, it means fertility and luxuriant vegetable growth for the regions of Eastern Asia. Of the original forest area, very little remains, much to the detriment of the people.

Agriculture is the chief industry, and many of the plants which are now cultivated all over the world were first grown in this part of Asia. Here rice, cotton, sugar cane, pepper, cinnamon, bananas, and many other fruits were grown centuries ago; and to-day the methods of production are much as they were when Caesar and Alexander in turn ruled the world (see *CHINA*). The kind of farming known as *intensive* is practiced; the farms are not large—some of them comprise only an acre or two—but they are worked to the utmost. Even the slopes of the hills are terraced, and many a farmer makes a living from a hillside farm so steep that strong retaining walls are necessary. Animals are comparatively few, for the land is too valuable to be used for grazing.

All through this eastern region minerals abound—gold, silver, copper, mercury, and most important of all, coal. It is in China chiefly that this last mineral is to be found, and this is fortunate; for great deposits of coal might exist in parts of Southern Asia and be of little use to the easy-going, unprogressive people. But the Chinese, like most people who



EVERYDAY LIFE IN ASIA



Japanese Baby Carriage



Arab Boys at School



Palestine Shepherd;
The Same After 2000 years



A Popular Cart in China



Native Rapid Transit in Ceylon



A Siberian Woman,
Lake Baikal Region



Native Automobile of India



A Dog of Tibet and His Master

OUTLINE AND QUESTIONS ON ASIA

Outline

I. Position

- (1) Latitude, $1^{\circ} 16'$ to $77^{\circ} 40'$ north
- (2) Longitude, 26° east to $169^{\circ} 40'$ west
- (3) Boundaries (see map)

II. Size

- (1) Length, 6,828 miles from east to west
- (2) Breadth, 5,270 miles from north to south
- (3) Area, 17,250,000 square miles
- (4) Rank, largest land mass in the world
- (5) Comparative size

III. Shape and Coast Line

- (1) Roughly triangular
- (2) Deeply indented coast line
 - (a) Estuaries on the north
 - (b) Great seas on south and east
- (3) Length of coast line
- (4) Islands

IV. Climate and Surface

- (1) Extremes of temperature
- (2) A land of contrasts
- (3) Extensive plains
- (4) Mountains
 - (a) Pamir plateaus
 - (b) Chief ranges
- (5) Steppes
- (6) Low-lying seas

V. People

- (1) Isolation of different nations
- (2) Characteristics of the yellow race
 - (a) Reverence for the past
 - (b) Ancestor worship
- (3) Malays or brown race in the south
- (4) Dravidians and Negritos, the black races
- (5) Aryan and Semitic races of the southwest
- (6) Religions in Asia
 - (a) Brahmanism
 - (b) Buddhism
 - (c) Confucianism
 - (d) Judaism
 - (e) Mohammedanism
 - (f) Progress of Christianity

VI. Political Divisions

- (1) Independent countries
 - (a) China
 - (b) Japan
 - (c) Siam
 - (d) Persia
 - (e) Turkey
 - (f) Nepal and small states in Arabia and the Himalayas
 - (g) Afghanistan

VII. Dependencies

- (1) France
 - (a) Pondicherry
 - (b) Indo-China
 - (c) Kwang Chau Wan
- (2) Great Britain
 - (a) Aden
 - (b) Bahrein Islands
 - (c) Ceylon
 - (d) Cyprus
 - (e) Hong Kong
 - (f) India
 - (g) Straits Settlements
 - (h) Federated Malay States
 - (i) Weihaiwei
- (3) Portugal
 - (a) Macao
 - (b) Goa
- (4) Russia
 - (a) Siberia
 - (b) Transcaucasia
 - (c) Transcaspia
 - (d) Republic of Uzbek
- (5) The Netherlands
 - (a) Islands in the East Indies

VIII. Northern Asia

- (1) Area, 6,660,000 square miles
- (2) Physical features
- (3) Inhabitants
 - (a) Nomadic Turkish tribes
 - (b) Mongol tribes in north
 - (c) Russian colonists
 - (d) Occupations

IX. Inner Asia

- (1) Area, 2,500,000 square miles
- (2) A region of barrier states
- (3) Chinese ownership and Russian influence
- (4) Causes of lack of development

X. Southern Asia

- (1) Area, 2,000,000 square miles
- (2) Surface and climate
- (3) Animal life
- (4) A region of many races

XI. Southwestern Asia

- (1) Historic importance
- (2) Diversified physical features
- (3) Climate

XII. History

- (1) Oldest history in the world
- (2) Biblical history
- (3) Spread of Mohammedanism
- (4) The Crusades
- (5) Power of Ottoman Turks
- (6) Modern exploration and development by Western nations

OUTLINE AND QUESTIONS ON ASIA—Continued

Questions

- How much territory has Turkey recently lost in Asia?
 What are the three great rivers of Siberia? The two chief rivers of China?
 What part of the continent has most influenced European civilization?
 In what way has Asia been connected with the important religions of the world?
 Is much tobacco grown in Asia?
 Under what European flag do over one-third of the people live?
 What are the tundras?
 What tendency of the people of Eastern Asia has retarded their progress?
 What is the tie which unites most of the people of Southwestern Asia?
 Name a well-known book about Asia that may have influenced the discovery of America.
 What states are independent of European rule?
 What is the "roof of the world"?
 Why is the region of the Hwang River becoming important in manufacturing?
 How do Mohammedans regard the use of liquor?
 What kind of cloth is made largely of material from Asia?
 Where are most of France's Asiatic possessions?
 What occupations have the people of Northern Asia?
 What are the four great rivers of Southern Asia?
 When did European interest in the Far East begin?
 From what parts of Asia do the best rugs come?
 How have the mountains affected the story of Asia?
 To what race do most of the people of Eastern Asia belong?
 In what part of the continent are some of the oldest records of civilization?
 What is the highest mountain in Asia?
 What writer has made many people familiar with Southern Asia?
 At what time during the Christian Era did it seem that Europe might come under the sway of Asiatics?
 What is Asia's greatest crop? Is it grown to any extent elsewhere?
 Why was it easy for Russia to gain a foothold in Asia?
 Which of Kipling's books tell us of the animal life?
 What country has four colonies in Asia which could all be put in a space that you could drive around in one day in an automobile?
 Why is agriculture important in Asia?
 What is the largest country in the world?
 What are some of the seas which surround Asia?
 What branches of knowledge originated in Asia?
 How did Germany lose its hold upon the Far East?
 Where does the elephant come from?
 What are the divisions of Russia-in-Asia?
 When did Europe first learn of the country beyond Asia Minor and Phoenicia?
 What effect has the density of population upon Eastern Asia?
 What countries of Asia are independent?
 How does the population of Asia compare with that of the world as a whole?
 How many miles above the lowest point on the continent is the highest peak?
 Why is Northern Asia so sparsely settled?
 Why are there so few grazing animals in Eastern Asia?
 Where is the lowest spot on earth?
 What new countries rose on the ruins of old Turkey?
 Where is the world's longest railroad?

so one-sided—Europeans invading Asia for their own profit. After the rise of Mohammedanism in the seventh century A.D., the fanatical Arabs pushed their sovereignty into Africa and thence into Spain, and for a time it appeared that Europe might become a prey to these zealots from the East. This danger was averted, but Western Asia long remained prominently in the thought of Christian Europe by reason of the Crusades, which were directed against the Saracens in the Holy Land. Meanwhile, a new power was rising in Asia which threatened Europe—the Ottoman Turks, who in 1453 gained a firm foothold on the western continent.

Throughout all this time, the rest of Asia was all unknown to Europe, but in the fifteenth and sixteenth centuries conditions changed. Spanish, Dutch, Portuguese, and British navigators explored the southern and southeastern coasts, and their governments promptly planted colonies where they had gone, and laid the foundations for considerable dominance of Asia. In the north, Russia was making inroads into Siberia, but the Farthest East, China and Japan, remained wrapped in the obscurity which had shrouded them through all the centuries.

Not until the nineteenth century did Western nations force an entrance into these countries which were living in the past, but to-day Western ideals and civilization are making themselves felt throughout Asia, and several of the Asiatic nations, particularly Japan and China, have come to play prominent parts in world politics. These statements must not be construed too literally, for while governments may have adopted more advanced theories, and scholars may have discarded much of the old formal learning, the majority of the people in most Asiatic countries live to-day as they lived a thousand years ago or more, ignoring and even resenting all attempts to introduce among them new civilization and new faiths. Asia thus remains, as one writer calls it, the "one stronghold of the spirit of the past."

Religions in Asia. An extremely interesting fact in connection with Asia is that every one of the great world religions had there its origin. Brahmanism, Buddhism, Confucianism, Judaism, with its two offshoots of Christianity and Mohammedanism, were all evolved in Asia. Most of them have yet their strongholds there, but Christianity has not made much progress in the land of its birth, and has grown slowly in Asia only as the results of almost superhuman efforts on the part of missionaries. To-day there are fewer than 20,000,000 Christians in the whole continent, while Brahmanism has over ten times that number, Buddhism nearly ten times, and Mohammedanism over twelve times. Of these great religions, the two offshoots of Judaism have been the only really militant, or missionary, faiths.

Other Items of Interest. Nearly four-fifths of the world's silk comes from Asia.

The almost constant struggle between Europe and Asia from earliest times is one of the interesting phases of history. Beginning, according to Herodotus, even earlier than the ten-year siege of Troy, which forms the story of the *Iliad*, it was continued in the wars in which Marathon, Thermopylae, and Salamis figured, in the expeditions of Alexander, the Roman conquests, the invasions of the Huns, the Saracen inroads, the Crusades and the contest with the Turk, which latter has extended into our own time.

Russia-in-Asia is the largest country on the globe, and it is under Soviet rule.

Asia is the only continent which rivals North America in tobacco growing, to which over a million acres are devoted, chiefly in India.

Rice is Asia's great crop. Its annual production of one hundred billion pounds is one hundred times that of Europe.

The finest rugs in the world come from Asia; those from Persia, Turkey, Bokhara, Khiva, Turkestan, and India are especially prized.

When Marco Polo's famous book about Asia first appeared, people thought it was fiction. But his stories and those of other travelers about the wealth of these far-away regions led to the discovery of America, which all early explorers thought was a part of Asia. See POLO, MARCO.

An interesting contrast is observable in the popular names of the founders of two of those great religions which originated in Asia. The Buddha is known, as in Edwin Arnold's poem, as the "Light of Asia," while the founder of Christianity bears the less-localized title of "Light of the World."

Related Subjects. The reader who wishes more detailed information as to Asia will find it in the following articles:

UNCLASSIFIED TOPICS

Cathay	Malay Archipelago
East Indies	Merv
Gobi	Pamir
Khyber Pass	Sakhalin
Levant	Tartary

CITIES

For lists and descriptions of the cities and towns of Asia, see articles on the various countries.

COAST WATERS

Arabian Sea	Indian Ocean
Arctic Ocean	Mediterranean Sea
Bengal, Bay of	Okhotsk, Sea of
Bering Sea	Pacific Ocean
Black Sea	Persian Gulf
Caspian Sea	Red Sea
China Sea	Yellow Sea

LAKES AND SEAS

Aral	Dead Sea
Baikal	Galilee, Sea of
Balkash	

MOUNTAINS

Altai	Elburz
Ararat	Everest, Mount
Caucasus	Fujiyama

Ghats	Pamir
Himalaya	Stanovoi
Hindu Kush	Tabor, Mount
Kuen Lun	Taurus
Lebanon, Mountains of	Tian-Shan
Nebo, Mount	Yablonoi
Olives, Mount of	

PEOPLES

In addition to these, there are in the articles on the various countries subheads treating of the people:

Aino	Kirghiz
Arab	Mahrattas
Aryan	Mongols
Bedouins	Negritos
Dyaks	Semites
Kalmucks	Turks

POLITICAL AND GEOGRAPHICAL DIVISIONS

Afghanistan	Kashmir
Anatolia	Khiva
Arabia	Korea
Armenia	Kurdistan
Asia Minor	Media
Assyria	Mesopotamia
Babylonia	Nejd Emirate
Baluchistan	Nepal
Bhutan	Oman
Bokhara	Palestine
Chaldea	Parthia
China	Persia
Chosen	Phoenicia
French Indo-China	Siam
Gilead	Straits Settlements
Hejaz	Syria
Hindustan	Tibet
India	Tongking
Indo-China	Transcaucasia
Iran	Turkestan
Japan	Turkey
Johore	Yemen

RIVERS

Amur	Lena
Brahmaputra	Mekong
Euphrates	Nerbudda
Ganges	Obi
Hoang	Sutlej
Hugli	Tigris
Indus	Yalu
Irrawaddy	Yangtze
Jordan	Yenisei

CHARACTERISTIC ANIMALS

Bear	Orang-Utan
Buffalo	Peacock
Camel	Pheasant
Cobra	Rhinoceros
Crocodile	Tiger
Elephant	Yak
Lion	Zebu

PRODUCTS

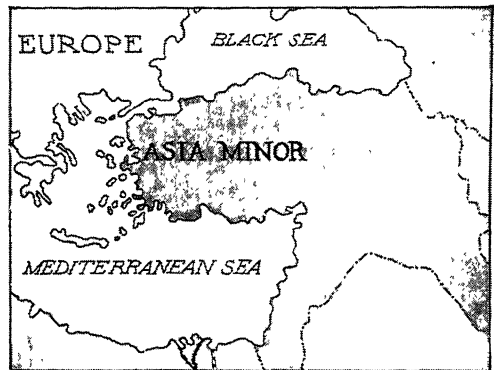
Banana	Date
Breadfruit	Gold
Coal	Pepper
Coconut	Rice
Cotton	Sugar Cane

HISTORY

Alexander the Great	Christianity
Assyria	Confucius
Brahmanism	Crusades
Buddhism	Mohammedanism

ASIA MINOR, OR SMALLER ASIA, the most westerly part of Asia, is the peninsula to the left of the upper Euphrates River, with the Mediterranean Sea on the west and south, and the Black Sea on the north. Like Arabia, it has not been a political unit, for

never until since the World War has it had a government of its own. In ancient times, it was divided into a number of small countries, each with its own ruler, and with most of these



"SMALLER ASIA"

That section of the Asiatic continent between the Black and Mediterranean seas is called Asia Minor.

the Greeks came into close relations. Especially along the coast, Greek colonies were numerous, and it was the aid which Greece rendered to some of the Ionian cities of Asia Minor in their attempt to free themselves from the rule of Persia which led to the Persian Wars, brought on by Xerxes.

Under the Roman Empire, Asia Minor was prosperous, for it possessed a fairly stable government, a fertile soil, and a pleasant climate, but in modern times, under Turkish rule, it has suffered severely and showed few signs of progress until the organization of the new National State of Turkey, under the guiding hand of Mastapha Kemal (which see). The present name of most of old Asia Minor is Anatolia.

Related Subjects. The following list will furnish to the reader more detailed knowledge of this historically important region of Asia:

Abydos	Miletus
Anatolia	Phrygia
Bithynia	Pontus
Ephesus	Samos
Galatia	Tarsus
Ionia	Taurus
Lydia	Turkey

ASKEILON, *as' ke lahn*, OR **ASKALON**. See SAINT GEORGE AND THE DRAGON.

ASOKA, *a so' kah*. See **BUDDHISM**.

ASP, the name applied most commonly to a venomous snake of Egypt, whose bite is quickly fatal. It resembles and is closely related to the cobra of India, but lacks the spectacle marks of the latter. Like the cobra, it distends the skin of its neck into a hood, and elevates the head and body. Egyptian jugglers extract its poisonous fangs and train the asp to perform tricks. This is not the "asp" with which Cleopatra is said to have committed suicide; the serpent she used was

probably a small-horned viper. The name *asp* is also given to a venomous snake found in Southern Europe and the Alps region, and related to the common adder of the British Isles.

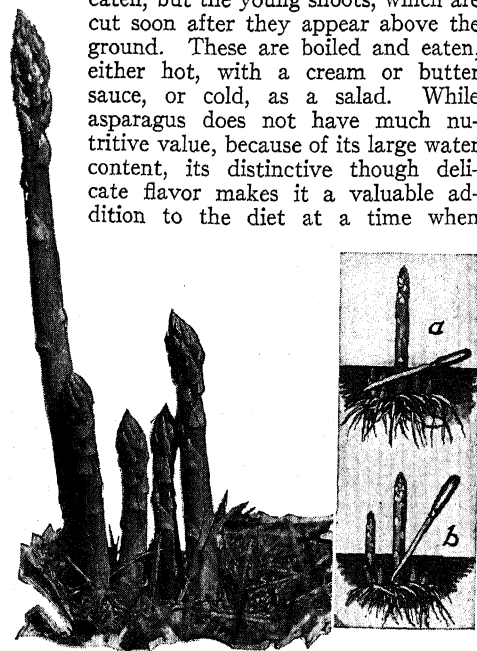
L.H.

Scientific Names. The scientific name of the Egyptian asp is *Naja haie*; of the European, *Vipera aspis*.

Related Subjects. The reader is referred in these volumes to the following articles:

Adder	Serpent Charming
Cleopatra	Snake
Cobra	Viper

ASPARAGUS, as *pair' a gus*, a plant which furnishes one of the favorite spring vegetables. It is not the fruit of the asparagus which is eaten, but the young shoots, which are cut soon after they appear above the ground. These are boiled and eaten, either hot, with a cream or butter sauce, or cold, as a salad. While asparagus does not have much nutritive value, because of its large water content, its distinctive though delicate flavor makes it a valuable addition to the diet at a time when



ASPARAGUS

(a) Wrong method of cutting; (b) right method of cutting. Thrust the knife into the ground as vertically as possible, in order not to injure other shoots.

many other green vegetables are not available. Asparagus plants should be allowed to grow three years from the seed before they are cut; after that, for ten or twelve years, they will continue to afford an annual supply, if the beds are protected from frost by straw or litter during the winter. For canning purposes, the stalks are often blanched, or whitened, though canned green asparagus is also in demand. The full-grown plant has a beautiful, feathery top, shaped like a miniature tree, and bears small flowers and bright-red berries. Some species are cultivated for ornament, and are incorrectly known as ferns. The United

States is one of the chief asparagus-growing countries. Leading states in the industry are California, New Jersey, and Illinois. B.M.D.

Scientific Names. Asparagus belongs to the lily family, *Liliaceae*. The common garden species is *Asparagus officinalis*. The ornamental species include *A. plumosus* and *A. sprengeri*.

ASPASIA, as *pa' she ah*, the most celebrated woman of ancient Greece, was born at Miletus, in Ionia. About 460 B.C. she became the wife of Pericles, though their marriage was not regarded as legal because the laws of Athens forbade the union of a citizen with a woman of foreign birth. The wit, beauty, and intelligence of Aspasia made her a worthy companion of the talented Pericles, and their home became the meeting place of the most learned and distinguished men of Athens. Their son was given full citizenship by a special decree. See PERICLES; GREECE (History).



ASPASIA

ASPEN, OR TREMBLING POPLAR, a species of poplar common in Canada and the United States. The tree is hardy, and grows rapidly. As the slender trunk becomes higher, the lower branches drop off, leaving a knot surmounted by a roll of bark which appear like eye and eyebrow against the pearly white trunk. The light-green, almost circular



ASPEN

(a) Young leaves unfolding. The leaves look like white flannel when they open early in the spring. (b) Mature leaves. These are ovate in form (see LEAVES), sometimes almost round, with fine teeth.

leaves, with saw-tooth edges, are set upon long, thin stems and flutter in every breath of wind, which suggests the popular name of the tree, the *quaking aspen*. The wood is used to make charcoal, bowls, trays, troughs, and pails. There is a closely related species native

to the cooler parts of Europe and Asia. See POPLAR.

G.M.S.

Scientific Names. The aspens belong to the willow family *Salicaceae*. The American species is *Populus tremuloides*; the European aspen is *Populus tremula*.

ASPHALT, as'falt (not as'fawlt), also called ASPHALTUM, is a substance having wide use as a paving, roofing, and waterproofing material.



THE ASPHALT LAKE
AT TRINIDAD

It is found as a natural deposit, and is also obtained as a by-product in the process of refining petroleum. Most of the asphalt used in the United States is the latter product. Asphalt is a form of bitumen, and is made up chiefly of hydrocarbons (which see). There are several varieties, ranging from liquid asphalt to a heavy, brittle form. It is black or brown in color, melts easily, and gives off a strong odor much like that of burning pitch. When pure, it burns without leaving ashes.

The most remarkable deposit of semi-solid asphalt is Pitch Lake, on the island of Trinidad, off the coast of Venezuela. The lake has an area of 114 acres. Its surface bears the weight of men, animals, and carts, provided they do not remain stationary. No matter how much material is cut out in any place, the hole fills up as a result of the settling of the entire mass. The lake is fed by underground springs, and is estimated to contain about 6,000,000 tons of material, so the supply will last for generations to come. It is supposed that Pitch Lake was formed from seepages of petroleum. After mixing with earthy material and cooling through long ages, the material became asphalt. Trinidad asphalt as such is too hard and brittle to make a good paving material, and requires the addition of a flux, such as liquid asphalt or petroleum residuum.

Another deposit of solid asphalt, but one of more plastic character, is found in the province of Bermudez, Venezuela. It is also extensively used for paving purposes. California possesses valuable deposits of both liquid and solid asphalts. Gilsonite, found in Utah, is a solid variety excellently suited for the manufacture of varnishes and insulating preparations. The latter is a hard, brittle mineral when mined, unlike the oil asphalts, which are soft.

Asphalt Pavement. Crude asphaltum must be put through a refining process before it can be used to make street paving. As the first step, the asphaltum is placed in great tanks and melted down, the material being stirred continually



DIGGING AND LOADING TRINIDAD ASPHALT

during this process. That the material may melt at a lower temperature than it would otherwise, a certain portion of substance remaining in the tank after crude petroleum has been distilled is put into the asphaltum to serve as a flux; all of the oils in the substance are thus saved. The resulting mixture is called *paving cement*. During the process, sharp, clean sand is being heated in large revolving drums to a temperature of about 300°. This is added to the mixture in definite proportion, a specified amount of carbonate of lime being also added. Then the three substances are thoroughly mixed by means of a number of rapidly revolving iron arms. The entire mixture is then ready to be used in laying the pavement. It takes three tons of the crude Trinidad material to make two tons of refined asphalt, ready for commercial uses.

A certain amount of preparation is required before the street is ready for the paving material, for it must be graded and rolled very

carefully. Then on the roadbed is laid a layer of hydraulic concrete, which consists of cement, sand, and broken stone. This concrete bed is also thoroughly rolled; all of the preliminary work must be very carefully done, if the pavement is to be durable. The "street mixture," as the prepared asphalt is called, is laid at a temperature of about 250° or 300°, and is spread down in two coats; the first, called the *cushion* coat, is from one-half to an inch thick, while the outside, or *surface*, coat is of sufficient thickness to make the entire bed of asphalt two and one-half inches thick. With hot rakes the workmen spread the mixture evenly from one side of the street to the other, and the surface is smoothed and finished with heated iron tampers and smoothers. After pre-



UTAH GILSONITE MINE

liminary rolling, a great steam roller weighing about ten tons is run over the top, but before this machine is used the surface coat is lightly sprinkled with hydraulic cement. See ROADS AND STREETS.

Gilsonite, a soft rock asphalt which occurs in masses several inches in diameter in bituminous sandstone and limestone. It is the only variety of dry asphalt, as contrasted with the



A GILSONITE MASS

lake of asphalt in Trinidad, and is the only kind that is mined. It is found principally in Utah, but occurs also in Oklahoma, Arkansas, and Texas.

Gilsonite is black in color, and has a lustrous surface. When warmed, it becomes quite plastic, and fuses with other substances. It is a non-conductor of heat and electricity, and is largely employed in the manufacture of paints and varnishes.

[This substance was named *gilsonite* because it was originally found on land belonging to S. H. Gilson, a Utah farmer.]

ASPHODEL, *as' fo del*, a name applied to various plants of the lily family, some of which have white, and some yellow, blossoms. The name is especially common in the poetry of all ages, but does not always mean the same flower. Thus, Homer, when he speaks of the asphodel meadows of Hades, refers to a pale, drooping flower which the Greeks believed covered the field in the region of the dead, while Pope, when he sings—

By those happy souls who dwell
In yellow meads of asphodel,

is referring to the same superstition, but has in mind the cheerful yellow daffodil. Indeed, the word *daffodil* is but another form of *asphodel*. The true asphodels, which are chiefly native to the Mediterranean countries, have fleshy roots and funnel-shaped flowers arranged in long, loose clusters. They are excellent garden plants. See DAFFODIL.

Scientific Name. The asphodel belongs to the genus *Asphodelus*, of the family *Liliaceae*. B.M.D.

ASPHYXIA, *as fik' si ah*. See FIRST AID TO THE INJURED; ASPHYXIATION, below.

ASPHYXIATION, *as fik si a' shun*, unconsciousness resulting from a lack of oxygen in the brain cells, which in turn is due to a lack of oxygen in the blood. The hemoglobin of the blood absorbs oxygen from the air in the lungs and carries it to the tissues. When it gives up oxygen to the tissues, it picks up the waste gases, particularly carbonic acid, and carries it to the lungs, where it is excreted. When the brain cells fail to get the oxygen they need, symptoms of asphyxia develop. There is

unconsciousness, which may have been preceded by dizziness and nausea, and flushing of the face, duskiness of the skin, and slow respiration. When death occurs, it is by stoppage of the breathing.

Among the causes of asphyxia are drowning, foreign bodies in the windpipe, hanging, and electric shock. In poisoning by garage gases and automobile smoke and by illuminating gas, the symptoms are due to asphyxia. These several gases contain carbon monoxide. The hemoglobin of the blood absorbs carbon monoxide and holds on to it strongly; so long as the blood is charged with carbon monoxide it is incapable of carrying oxygen, and asphyxiation results.

Resuscitation. Apply artificial respiration by the prone-pressure method (for method, see DROWNING). If oxygen is used, it should contain five per cent carbonic acid. W.A.E.

ASPIRIN, a drug in wide use as a cure for headache, cold in the head, sore throat, and neuralgic and rheumatic pains. It reduces temperature and allays pain, and is a valuable remedy when taken under competent medical advice. Aspirin can be purchased in the form of tablets at all drug stores. The ease with which it can be obtained and its definite effects have made it one of the most popular self-prescribed remedies. Occasional use of aspirin in small doses is not harmful, but the "aspirin habit" acquired by some persons is very injurious, as the drug has a tendency to irritate the mucous membranes and to depress respiratory action. See ANODYNES.

[Aspirin is known technically as *acetyl-salicylic acid*, and is a compound of carbon, hydrogen, and oxygen. It is a crystalline, odorless powder, slightly soluble in water and freely so in alcohol. See SALICYLIC ACID.]

ASQUITH, *as'kwith*, HERBERT HENRY (1852-1928), English Prime Minister early in the World War, and raised to the peerage in 1925 as the Earl of Oxford and Asquith. His Ministry was notable for the Parliament Act of 1911 which abolished the veto power of the House of Lords, for the struggle for Home Rule in Ireland, and finally for the World War. Personally considered cold and lacking in magnetism, Asquith was able, however, to hold together the Liberal party until November, 1924.

Two years after his graduation with honors

from Balliol College, Oxford, Asquith began the practice of law, and became distinguished for sound judgment and clear thinking, qualities which marked him in Parliament. His long service in the House of Commons began in 1886. In 1892 he became Secretary for Home Affairs in Gladstone's last Ministry, and from 1895 to 1905 was one of the leaders of the opposition. He opposed Chamberlain's proposal for a protective tariff, and made skilful use of this issue to unite the various Liberal factions. His appointment to the Cabinet in 1905 was a natural result, and as Chancellor of the Exchequer he was really the government leader, because of Sir Henry Campbell-Bannerman's poor health. In 1908 he succeeded Campbell-Bannerman as Prime Minister, thus becoming leader in name as he had been in fact.

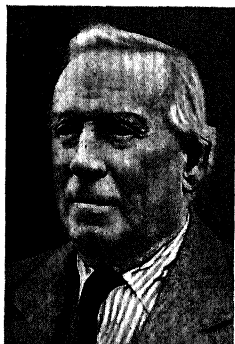
The Asquith Ministry underwent reorganization in May, 1915, a number of prominent Conservatives being included to form a coalition, and in December, 1916, Asquith himself resigned, being succeeded by David Lloyd George. For the remainder of his life he was overshadowed by the "little Welshman," who was England's dynamic force during most of the war, but he still held the Liberal leadership. On domestic questions, in 1926, Asquith tried to drive Lloyd George out of the party, but the latter's strength with the people frustrated this design.

When he died, it was the wish of the nation that his remains should repose in Westminster Abbey, but in his will he had requested a simple, unostentatious burial elsewhere.

Margot Asquith, daughter of Sir Charles Tennant, married Herbert Henry Asquith in 1894. Her prominence in London society and her brilliance and acid wit made her *Autobiography of Margot Asquith*, published in 1922, one of the most discussed books of the season. While the book was criticized for its frankness regarding Londoners, it was regarded as a valuable record of her world and time. She has lectured in the United States, and in 1925 published a second book, *Places and Persons*.

ASS, or **DONKEY**, an animal of the horse family, the difference between asses and horses being observed in the larger size and the shorter ears of the latter. In shape, the ass also resembles the zebra. In its wild state, in the plains of Arabia, the ass is a handsome animal, fleetier than the horse, and is courageous and intelligent. The domestic ass is noted for its dullness, obstinacy, and general down-trodden appearance. In the East, the ass has been valued for centuries as a beast of burden, and in Africa, it is used in certain districts where the deadly tsetse fly is found, for it is apparently immune to that insect's fatal bite.

The male ass is of high value for breeding purposes, for the offspring of an ass and a



HERBERT HENRY ASQUITH

mare is the *mule*, a valuable draft animal (see MULE). The domestic ass is noted for its ability to subsist on the coarsest food in small quantities. It responds quickly, however, to good treatment, which it too seldom gets. The milk of the ass is nutritious, and in parts of Northern Africa large herds are kept solely as milk animals. W.N.H.

Scientific Name. Asses belong to the family *Equidae*. The domestic ass is a development of the African species, *Equus asinus*.

ASSAM, *as sam'*, a province of British India, with an area of 53,000 square miles. It lies to the south of Tibet, at the head of the Bay of Bengal. The climate is marked by the heaviest rainfall in the world, averaging over forty feet annually; in one year there was a record of nearly seventy feet. Malarial diseases are common in the lowlands; otherwise the province is not unhealthful.

A large part of the province may be designated as forests of jungle, the trees including teak, date and sago palm, and the Indian fig-tree. In the jungles roam the elephant, rhinoceros, tiger, and other wild animals; serpents and waterfowl abound. Coal, petroleum, and limestone are found in abundance, iron is smelted to a small extent, and gold-dust is found in small quantities. The article of most commercial importance is tea, the yield of which is now over 295,000,000 pounds annually. Other crops raised are rice, Indian corn, pulse, oil seeds, sugar cane, hemp, jute, and potatoes. The population is over 7,500,000, more than half of whom are Hindus; there are also many Mohammedans, and a few Christians. The seat of the government, at the head of which is a British governor, is Shillong. See ASIA, map.

ASSASSINATION is murder of a public person done treacherously, either for pay or for revenge. The name came from *Assasins*, an organization which in the twelfth century was powerful in Persia and Asia Minor and which caused the murder of all who opposed the society. The work of assassination fell upon a band chosen for the purpose; its members were stimulated to carry out their orders by the influence of *hashish* (which see). From this habit, they obtained the name *hashishin*, or *hemp-eaters*.

The assassin may be hired by a person who hopes to gain his end by the death of his victim, or he may commit the murder to satisfy his desire to avenge fancied or real grievance, or in hope that through the death of his victim he will establish some reform, religious or political. In ancient times the assassination of rulers and other high public officials was often applauded. The assassination of Julius Caesar and a number of Roman emperors are good illustrations. Now, however, the

brutal killing of a public personage is looked upon as an atrocious crime, punishable by death.

Since 1900 the following European rulers have been assassinated:

Humbert of Italy, July 29, 1900
Alexander of Serbia and Draga, his queen, June 11, 1903.
King Carlos I and son, of Portugal, February 1, 1908.
King George of Greece, March 18, 1913.
Czar Nicholas of Russia, July 16, 1918.

Three Presidents of the United States have been assassinated:

Abraham Lincoln, April 14, 1865.
James A. Garfield, July 2, 1881.
William McKinley, September 6, 1901.

The assassination of the Archduke Francis Ferdinand of Austria and his wife, June 28, 1914, was one of the causes of the World War, which began one month later.

ASSASSINS, ORDER OF. See ASSASSINATION.

ASSAULT, as sahl't, AND BATTERY. In law, assault is a threat to do bodily harm to another. When the attacking party reaches and touches the person of the victim, battery is added to assault. The two offenses are separate and distinct, but they usually occur together and are punished as one. There are, however, some instances of assault without battery.

Assault and battery is a crime punishable by fine or imprisonment, and it is also a civil offense. The person injured can sue for and may recover damages from the offender. In applying physical punishment to those under their care, parents and teachers must use only the force necessary in each case, any excess being considered assault and battery.

ASSAYING, as say'ing, or determining the amount of the different metals which are contained in a sample of ore, of bullion, or of alloy, is carried on in many different ways, according to the kind of mineral to be measured. In general, the processes are known as *wet* and *dry*.

The Dry Process. In this method, heat is usually employed to separate the metals contained in the sample. If, for instance, the assayer wishes to find the amount of gold and silver in samples of ore, he mixes the ore with lead and melts them in a *muffle*, which is a clay oven about the size of a drain tile, with an arched roof and air openings at the side. All the impurities flow off, leaving the gold and silver surrounded by molten lead and oxide of lead. The next step in the process is called *cupellation*. The mass of gold, silver, and lead is placed in a cupel, a small, exceedingly porous cup made of a paste of bone ash and water. When the cupel is placed in the

muffle, the lead is oxidized by the air which passes over it, and all the oxide disappears in vapor or is absorbed by the porous walls of the cupel. Only gold and silver now remain, and these two are separated by the application of nitric acid, which dissolves the silver. The difference between the weight of the gold and silver together and that of the remaining gold gives the weight of the silver.

The Wet Process. In this form of assaying, the metals are dissolved out of the ore or alloy which contains them by applying certain chemicals, then weighed, or measured according to the effect they have chemically. Thus, if the silver washed out by the nitric acid in the last step of the dry process described above is combined with a solution of salt, and the resulting white powder, chloride of silver, is weighed, the amount of silver is known from the established chemical formulas. In assaying silver bullion at mints and assay offices, the exact amount of salt solution necessary to separate the silver is measured as it is poured out, and from this the amount of silver is known.

Assay Office, a government bureau under the direction of the Treasury Department, which purchases, refines, and sells gold and silver bullion, but does not strike coins. There are assay offices in the United States at New York, Carson City, Nev., Denver, Colo., Boise, Ida., Helena, Mont., Deadwood, S. D., Seattle, Wash., New Orleans, La., and Salt Lake City, Utah. In Canada assaying is under the supervision of the Royal Mint. T.B.J.

ASSEMBLY, a name often applied to a state legislature in the United States, or to the state house of representatives as contrasted with the senate. See LEGISLATURE.

ASSES' BRIDGE. See GEOMETRY (Some Famous Theorems).

ASSESSOR, an officer whose duty it is to make a list of all the property in the territory over which his authority extends, for purposes of taxation. The list must contain the name of the owner and the kind and value of his property. If the owner has both real and personal property, each must be listed separately. When completed, the lists are turned over to the board of review and ultimately to the tax collector. The assessor is a township or city officer. Large cities usually provide a board of assessors, for the duties are too burdensome for one man. In most instances, the assessor is not a salaried officer, but is paid for time actually employed.

ASSIGNMENT, a *sine' ment*, a legal term meaning the transfer, or making over to another person, of personal or real property or rights in that property. The person transferring the property is the *assignor*; the one to whom it is assigned is the *assignee*. Assignments are legal only if made in writing. A person can

assign both property which he already possesses and that which he expects to possess. A farmer may assign his growing crops, and a laborer may assign wages yet to be earned. Contracts for personal service, trusts, and guardianships cannot be assigned. There is no particular legal form necessary to make an assignment valid; a clear statement showing intent is sufficient.

ASSIGNOR AND ASSIGNEE, as *i nawr'*, as *i ne'*. See ASSIGNMENT.

ASSIMILATION, a *sim i la' shun*, the process by which the nutritive elements of food are changed into living tissue. This change begins with the digestion of food, and is completed in the cells (see CELL). In animals and man the circulating blood brings to the cells materials which they have the power of changing and so adapting to their own uses that growth and development are possible. In order that assimilation may take place rapidly in any organ, there must be a large supply of blood. Muscles and nerve tissues are well supplied with blood vessels; there are fewer in bone, which changes more slowly. The blood itself must circulate with a normal degree of rapidity, be of sufficient amount, and composed of proper materials. There must also be taken into the system a sufficient quantity of food that is of good quality and easily digested. K.A.E.

Assimilation, when used in regard to the operations of the mind, means the interpretation of any new object or phenomenon by means of what one has already learned through previous experience with similar objects or phenomena. After the period of infancy, one rarely learns anything new except by the process of assimilation. See ASSOCIATION, LAWS OF.

[In plant life, the term refers to the transforming of inorganic matter into plant tissues.]

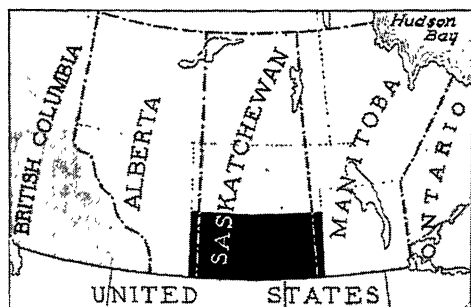
Related Subjects. The reader is referred in these volumes to the following subjects:

Cell	Digestion
Blood	Nutrition

ASSINIBOIA, a *sin i boi' ah*, a former district of Canada. It was organized in 1882 as a part of the Northwest Territories (which see), and in 1905 became a part of the new province of Saskatchewan. It extended from the present western boundary of Manitoba to a point a short distance beyond the present western boundary of Saskatchewan, and from the international boundary northward to an east-and-west line drawn just south of the city of Saskatoon. The area of this district was 90,000 square miles. For details of the physical characteristics, climate, natural resources, and products, see SASKATCHEWAN. See map, page 458.

ASSINIBOINE, a *sin' i boin*, one of the rugged and beautiful peaks in the Canadian Rockies. It lies on the boundary between Alberta and British Columbia, twenty miles

south of Banff, and rises to an altitude of 11,860 feet. Its shape is somewhat triangular, like that of the Matterhorn in Switzerland, and like the Matterhorn, it is extremely diffi-



ASSINIBOIA

The section in solid black was the former district of Assiniboia. The light, dotted lines indicate the boundaries of other districts prior to 1905, and the heavy, broken lines mark present provincial boundaries.

cult to climb. The east face is a sheer precipice, and the west face, though less steep, is covered with ice and snow, which frequently break loose in great avalanches. The lower part of the northern slope presents three distinct faces, which attain an angle of 80° where they merge into the final spire. The first ascent of Mount Assiniboine was made in 1901. See CANADA (Physical Characteristics: the Mountains); ALBERTA.

ASSINIBOINE RIVER, the chief tributary of the Red River of the North, into which it flows, near the city of Winnipeg. The Assiniboine proper rises in Eastern Saskatchewan, near the Manitoba boundary, and flows southward for 200 miles to meet the Qu'Appelle, which rises about fifty miles northwest of Moose Jaw and flows eastward for 270 miles. From this junction to the mouth of the Assiniboine at Winnipeg is a course of about 250 miles, through some of the richest grain lands of the Dominion. Near Brandon, Man., the Assiniboine is joined from the south by the Souris, which rises in the southeastern corner of Saskatchewan, makes a wide bend through North Dakota, and then returns northward. The drainage area of this combined system is 52,600 square miles.

ASSINIBOIN INDIANS. See INDIANS, AMERICAN (Most Important Tribes).

ASSIZES OF JERUSALEM. See GODFREY DE BOUILLON.

ASSOCIATED PRESS, a coöperative, non-profit-making organization composed of publishers of American daily newspapers who combine to furnish each other with the important news of the day. No newspaper not a member of the Associated Press may receive its dispatches.

With a view to making this service of the greatest value, the United States is divided into geographical sections. News dispatches are sent to the headquarters of each division; those that are of national interest are telegraphed to all members in the other sections; those of more local importance but without general news value are sent only to those papers in sections where they are desirable for use. Each newspaper member also contributes its own local stories to the news service.

The Associated Press is a close corporation, including some 12,000 newspapers in its membership. In great cities, a certain number of franchises, or memberships, are available, but in small cities only one paper can be a member of the association. No fixed sum per year is assessed, but the cost of maintenance of the service is prorated among all members.

The Associated Press employs correspondents to represent it in all the great cities of the world, but no papers in Europe are members. European journals are served by their local press associations, among which the Reuter and the Havas agencies are probably the largest.

[There are in the United States other agencies with wide fields, but none other is so great or so influential. Among these minor organizations may be named the United Press, which is of growing importance, and the International News Service.]

ASSOCIATION, LAW OF, in psychology, denotes the way the mind travels from one idea to another. The conditions under which a thought suggests another are classified by psychologists under four general laws, as follows:

- (1) Those ideas which are perceived together, or *contiguity*;
- (2) Ideas following each other in order of time, or *succession*;
- (3) Those ideas which bear a close likeness to each other, or *similarity*;
- (4) Those ideas which are opposite in meaning, or *contrast*.

We also recall experiences that have occurred together or in the order in which they are experienced, by their similarity, and sometimes, though rarely, by their contrast. If you will picture your breakfast table in your mind's eye, you will find that this will bring up images or memories of the people you saw at breakfast, the things that were said there, and so on. If you will follow the images that come into the mind long enough, you will find that they come in about the order in which they were experienced through the day. See PSYCHOLOGY; HABIT; MEMORY. C.E.S.

ASSOCIATION FOOTBALL. See FOOTBALL, subtitle.

ASSOCIATION OF COLLEGIATE ALUMNAE. See AMERICAN ASSOCIATION OF UNIVERSITY WOMEN.



THE ASSUMPTION, BY TITIAN

[The original painting does not include the decorative side borders, shown above.]

ASSOCIATION OF COMMERCE. See CHAMBER OF COMMERCE.

ASSUAN, *ahs swahn'*, EGYPT. See EGYPT (Modern Cities).

ASSUAN DAM. See AGRICULTURE (Other Lands); EGYPT.

ASSUMPTION, *as sump' shun*, FEAST OF THE, a festival of the Catholic Church, observed on the 15th of August by Roman and Greek Catholics, in memory of the miracle through which the soul and body of the Virgin Mary were taken into heaven by Christ and the angels. It was first celebrated in the Greek Church in 582, and in the Roman Church in the seventh century. This festival is not observed by any of the Protestant churches.

The Assumption in Art. The story of the Assumption lends itself to treatment by painters, and is a favorite subject in religious art. *The Assumption*, painted by Titian, and now in Venice, pictures the Virgin being carried to heaven on shining clouds, while rejoicing angels surround her, and from the earth the Apostles gaze upward with wonder in their faces. Titian has another painting of this title in the Cathedral of Verona. The painting by Rubens, which was secured by the cathedral at Antwerp, Belgium, shows the Virgin ascending to heaven with the angels, and below an empty tomb, about which several of the Apostles and a number of women are standing. The Virgin in the canvas of Perugino, in Florence, is one of that artist's most beautiful portraits. This painting has, besides the Virgin, representations of four saints in the foreground.

Another beautiful canvas is that by Murillo, in the Hermitage Museum, Leningrad, in which the Virgin is seen floating upward on clouds, while bands of cherubs rise with her. Among frescoes picturing the ascent of the Virgin, are those of Correggio, in the cupola of the Cathedral of Parma, Italy, and of Ferrari, in the Church of San Cristoforo, in Vercelli, Italy.

[Illustration of the Assumption on page 459. See each artist named, in his alphabetical position in these volumes; also the article PAINTING.]

ASSUR, *ahs' soor*, an old capital of Assyria (which see).

ASSURBANIPAL, *ahs shoor bah' ne pahl*, (668-624 B.C.), also spelled ASHURBANIPAL, and by the Greeks known as SARDANAPALUS, is the name of the last great king of Assyria, a ruler distinguished for his interest in art and literature. He erected magnificent buildings in Nineveh, the capital city, as well as in other cities of his realm, and in his royal palace he gathered a great collection of Assyrian and Babylonian writings. The remains of this famous library, consisting of thousands of clay tablets, are now in the British Museum.

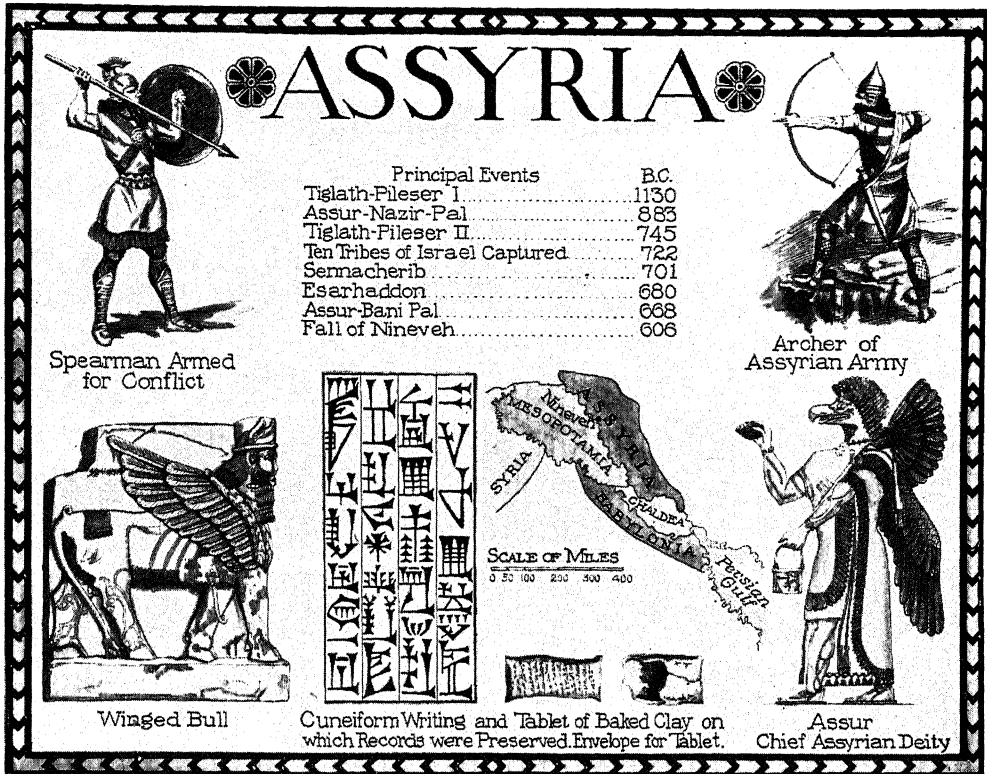
Assurbanipal was also a great warrior. He fought the Egyptians, captured the city of Tyre, and cruelly laid waste the country of Elam, to the southeast, as a punishment for aiding Babylonia, which had rebelled against him. Eighteen years after his death, the monarchy came to an end. See ASSYRIA.

ASSYRIA, *a seer' e ah*, the name of an ancient country lying west of the Tigris River and north of Babylonia, forming with that country the cradle of civilization. Along its eastern boundary rose the mountains of modern Kurdistan; on the north lay the country of Armenia. Assyria was the head of a great military empire that in the seventh century B.C. stretched from the Black Sea to the Persian Gulf, from the frontiers of India to the Mediterranean, and included Egypt. So closely connected were the Assyrians and Babylonians in their geography, their history, and their customs that historians do not find it easy to treat separately these two ancient peoples, the pioneers of the world's civilization.

Geography. Assyria was a fertile plain with low ranges of hills and shallow valleys, through which the great tributaries of the Tigris flowed. The Assyrians in early times built a network of canals, so that the land was under irrigation when rain failed them, and they cultivated olives, vines, fruits, and vegetables. From the hills they procured iron, copper, and lead; from the neighboring mountains, limestone, sandstone, alabaster, and basalt.

People. Assyria was settled, probably as early as 2500 B.C., by colonists from Babylonia, who were of Semitic stock. Though they resembled their Babylonian kinsmen in many ways, the Assyrians were the more rugged and warlike; their energy in extending their territory has given them the name, "Romans of Asia." Two things contributed to their great military success: first, the Assyrians were the first people to use iron weapons; second, their organization was based on war and conquest. The Assyrian kings inflicted cruel torture on prisoners of war. Sculpturing on stone slabs recovered from the ruins of the palaces show conquered kings with hooks thrust through their lips; also prisoners being whipped to death or having their tongues torn out. Hunting, also, was the delight of the kings of Assyria, and they were as careful in recording the number of wild beasts slain as the number of cities that were captured.

The religion of the Assyrians was practically that of the Babylonians, a worship of many gods, but the former had a distinct national deity in Assur, creator of heaven and earth. They were a literary people, using for the most part tablets of baked clay as a writing material. Assurbanipal, the last great king of Assyria, collected a library of thousands of these tablets, many of which have been unearthed



from the ruins of the king's palace at Nineveh, and placed on view in the British Museum. It is the earliest library known. The characters on these tablets have the shape of a wedge, a form of writing that is known as *cuneiform*. Assyrian literature consisted of hymns to the gods, mythological poems, and writings on law, science, and history. These people had a well-organized form of government. The kings exercised unlimited power, but appointed governors to rule over the cities.

Art. The Assyrians made remarkable progress in sculpture. From the ruins of their buildings there have been unearthed two-winged, human-headed lions and bulls twelve feet in height, besides a large number of stone slabs decorated with raised figures that picture scenes in Assyrian life and history. These show how the soldiers marched, encamped, crossed rivers, attacked cities, cooked, tortured enemies, and sacrificed to the gods; they picture the king banqueting with the queen and hunting lions with his court. Sculptors worked chiefly in soft limestone.

Assyrian architecture was more or less a copy of the Babylonian. Sun-dried brick, as in Babylonia, was used in building, but the Assyrians often faced their foundations and walls with stone slabs. Their palaces were four-sided, and their temples had the shape of

a pyramid. These buildings were erected on great terraces or platforms; that at Nineveh, on which the royal palace stood, built by Sennacherib, covered an area of about one hundred acres, and was nearly seventy feet in height. Though only one story high, the palaces of the kings were often of a magnificence that no age has surpassed, and their many courts, chambers, and passageways sometimes spread over twenty or twenty-five acres. The decorations, consisting of stucco work, panels of precious woods, enameled bricks, and sculptured slabs, produced a striking effect. At the gates of the palaces, to guard the approach, were placed the great man-headed bulls and winged lions.

The industrial arts were highly developed. The king and his courtiers dressed in richly embroidered and figured stuffs; their arms and armor were highly finished; the king's throne was of carved ivory and wrought gold; and he was served from superbly decorated gold, silver, and bronze vessels.

History. In the dim light of early Assyrian history, the names of kings begin to appear about 2250 B.C., and the first periods are largely records of military campaigns. In the twelfth century, under the leadership of Tiglath-Pileser I, the Assyrians gained in a large measure control over Babylonia. With

Outline and Questions on Assyria

I. Position and Size

- (1) Varied in extent
- (2) Present boundaries

II. The Land

- (1) Fertile plain
- (2) Low hills
- (3) Irrigation and cultivation of the soil
- (4) Mineral wealth

III. Inhabitants

- (1) A Semitic people
- (2) Characteristics
- (3) Religion, learning, and art
- (4) Luxury of ancient life
- (5) Industrial arts

IV. History

- (1) Beginnings of Assyrian power
- (2) Conquest of Babylonia
- (3) Supremacy of Assyria
- (4) Decline of power
- (5) Overthrow of kingdom by Medes and Babylonians
- (6) Later conquests
- (7) Turkish possession

Questions

How was the winged lion of Assyria used?

In what way was the history of the country bound up with Biblical history?

In what century did it reach the height of its glory?

How did Nineveh rank among the cities of the East?

Did the Assyrian farmers, in years of drought, lose all their crops?

To how many nations did the territory known as Assyria belong in the course of its history?

Justify the title, "Romans of Asia," as applied to the Assyrians.

What brought about the decline of power?

Did the royal palaces indicate a high or low order of civilization?

What was the form of the written characters?

How have we learned many facts about the military and court life of Assyria?

For what will Arbela always be famed in history?

Who wrote about Nineveh as a crumbling mass of ruins?

this ruler began that devotion to the arts for which Assyrian monarchs were famous. After two centuries there arose a strong ruler named Assurnazirpal, who waged vigorous wars on all sides and made Assyria a great empire. Nineveh, which in the eleventh century had been made the capital, rose to the position of mistress of the Eastern world. The successors of Assurnazirpal pushed their armies westward, making conquests in Syria and Phoenicia.

Sargon II was the founder of the last and most glorious dynasty of Assyria (721-606 B.C.). He completely conquered Babylonia, overcame the Hittites, put an end to the kingdom of Israel, and made Judah and the Mediterranean cities pay tribute. His successors, Sennacherib, Esarhaddon, and Assurbanipal (Sardanapalus), were kept busy maintaining the supremacy of the Assyrian power over the broad realm. Under Assurbanipal, Assyria rose to the height of its greatness; from the frontiers of India to the Mediterranean Sea its rule was supreme. But as the treasures of the world poured into the capital, the people became fond of ease and luxury and would not go to war to protect their foreign possessions. Province after province revolted, and after the death of Assurbanipal, the decline of Assyrian power was rapid.

Finally, in 606 B.C., the Babylonians under Nabopolassar, the Chaldean, with the aid of the Medes, overthrew Nineveh, which Xenophon, 200 years later, saw as a crumbling mass of ruins, without a name (see ANABASIS). Assyria was then divided between the Medes and Babylonians, and the great civilization of the Tigris-Euphrates Valley soon came to an end. Afterwards, as a province of the Persian Empire, the territory was conquered by Alexander the Great, and after his death was ruled by his successors. Coming later under Parthian, Roman, and Persian rule, it was seized by the Turks in 1638, and became a part of the Turkish Empire, until after the World War.

The Cities. Assur, on the west bank of the Tigris, the city from which the country took its name, was the oldest capital. Calah, a later capital, lay on the east bank, on the site of the modern Nimrud. The cities of chief importance were the following:

Arbela, *ahr be' lah*, an ancient town which gave its name to the battle fought in 331 B.C., in which Alexander the Great overcame the Persian king Darius, and thus made possible the spread of Greek civilization over Western Asia. This battle, one of the fifteen decisive battles of history, was actually fought at Gaugamela, about twenty miles from Arbela. On the site of the ancient city is the modern town of *Arbil*, in the province of Mosul, in Iraq. See FIFTEEN DECISIVE BATTLES OF THE WORLD; IRAQ.

Nineveh, *nin' e veh*, was founded, according to Biblical narrative, by Nimrod, and became, in its

later history, the capital of the empire and one of the most magnificent cities of antiquity. On the decline of the Assyrian power, Nineveh was taken, in 606 B.C., by a combined attack of the Medes and Chaldeans, and so completely destroyed that even its site was forgotten.

In 1820, an Englishman named Rich examined mounds lying on the left bank of the Tigris, opposite the town of Mosul, and concluded that beneath them were the ruins of Nineveh. In 1842, Botta, and later Loftus, Layard, Hormuzd Rassam, and George Smith, made excavations, revealing the glories of ancient Assyria. Royal palaces, on raised platforms, filled with works of art and having alabaster pavements sculptured in carpet-like designs, were uncovered; also libraries containing great numbers of stone slabs, prisms, cylinders, and tablets in cuneiform inscription, bringing to light much of importance in the history of Assyria.

Among the latter are tablets bearing legends of the Creation and the Flood, and a pair of colossal winged bulls and several cylinders describing the wars of Sennacherib, recorded in the Scriptures. Other records bear out the vivid prophecies in *Nahum* and *Zephaniah* of Nineveh's downfall. From results of the excavations, the inner wall of the city is thought to have had a circuit of about eight miles. There were elaborate outworks, moats, and defenses. The population is estimated to have been at least 175,000. Many relics of the Ninevite civilization are now in the possession of the British Museum.

Related Subjects. The reader is referred in these volumes to the following articles:

Anabasis	Sennacherib
Assurbanipal	Tiglath-Pileser
Babylonia	Tigris River
Cuneiform Inscriptions	Winged Lion
Nabopolassar	Xenophon

ASTARTE, *as tahr' te*, the principal female deity of the Phoenicians, was the goddess of fruitfulness and fertility. She was worshiped under various names by other ancient peoples, and was sometimes regarded as the goddess of the moon and of hunting. She was identified with the Greek Aphrodite and also with Artemis (Diana), with the Ishtar of the Assyrians and Babylonians, and with the Isis of the Egyptians. In the Old Testament, this goddess is mentioned frequently under the name Ashtoreth. In *II Kings* XXIII, 13, it is told that King Josiah tore down an altar which Solomon had built in her honor; and other passages show that the Israelites often turned from their true religion to her worship. The planet Venus was her star.

Related Subjects. The reader is referred in these volumes to the following articles:

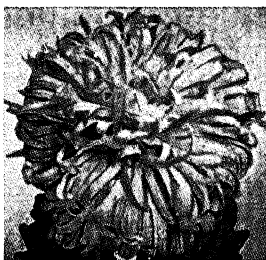
Aphrodite
Diana

Isis
Mythology



ASTERS

Every aster in my hand
Goes home loaded with a thought
—EMERSON: *The Apology*.



ASTER, *as' tur*, from the Greek word for *star*, is the name of a genus of plants which are so called because of the starlike appearance of their flowers. This group includes more than 200 species, which grow in abundance in North America and more sparingly in Asia, Europe, and South America. The flowers resemble those of the daisy, and in England,

where asters are in bloom late in September, the time of the feast of Michaelmas, they are known as the *Michaelmas daisy*.

The various species show many charming shades of color, ranging from white to dark purple, and including bright rosy-lilac, pink, rose, crimson,

pale blue, and violet; along with goldenrods they dominate the autumn flora, especially of Eastern North America. Among the more showy varieties, none is more beautiful than the stately *China aster*, which sometimes grows in gardens to a height of eighteen inches. Asters flower late in summer, and in some places blossom until November or December. They adapt themselves readily to cultivation and are popular garden plants.

B.M.D.

Literary Reference. Many poets have told of the late-flowering habits of the aster, none more beautifully than Bryant, in his *Death of the Flowers*:

The windflower and the violet, they perished long ago,
And the brier-rose and the orchis died amid the summer glow;

But on the hills the goldenrod, and the aster in the wood,

And the yellow sunflower by the brook, in autumn beauty stood.

Scientific Names. The asters belong to the family *Compositae* (see COMPOSITE FAMILY). The China aster is *Aster chinensis*. The showy New England aster, another popular favorite, is *A. novae-angliae*.

ASTEROIDS, *as' tur oydz*, or **PLANETOIDS**, the name commonly applied to numerous minor planets which revolve between the orbits of Mars and Jupiter, occupying a place in the solar system which would naturally belong to a planet. The diameter of the largest is about 500 miles, while most of the others are very much smaller, some being less than ten miles in diameter. The known ones now number about 1,200, and fresh discoveries are frequently announced. Ceres, the first and largest, was discovered January 1, 1801, and within six years three others were seen, which

were named Pallas, Juno, and Vesta. For nearly forty years investigations were carried on, but no more planets were discovered till December 8, 1845, when a fifth planetoid (Astraea) was found in the same region.

Originally, these planets were found by patiently comparing telescopic fields with star charts, but photography is now used and greatly simplifies the work. Eros, one of the smallest, discovered in 1898, at times approaches nearer to the earth than does any other body except the moon. The mean distances of the asteroids from the sun vary between 135,000,000 and 500,000,000 miles, though there may yet be undiscovered ones at far greater distances. The periods of revolution vary between 643 days for Eros and more than 5,000 days for the most remote. Their total mass does not exceed one five-hundredth of that of the earth.

Various theories have been advanced to account for the planetoids. Some astronomers regard them as the remains of a large planet broken into fragments by the attraction of Jupiter, and others believe they are the parts of a ring of meteoritic particles remaining from the original nebular matter out of which the solar system was formed. See SOLAR SYSTEM; NEBULAR HYPOTHESIS (Planetesimal Hypothesis). F.B.L.

ASTHMA, *az' mah*, a disease characterized by repeated attacks of labored breathing. The theory is that in asthma there is some spasmodic constriction of the small bronchial tubes and some swelling of the lining thereof. It is not a febrile disease (a disease running to fever). As a rule, it is an intermittent and not a continuous disorder; the attacks are somewhat more frequent and uncomfortable at night and during bad weather.

Bronchial asthma is a form of the disorder in which there is an unusual manifestation of bronchitis, in addition to the asthma. A person develops a bronchitis due to infection with some bacterium. His bronchitis becoming chronic, eventually, this simple chronic bronchitis takes on asthmatic qualities. We say that the person has chronic bronchitis with asthma, or better, that he has bronchial asthma. In such a case, the man has become sensitized to the proteins of the bacteria which caused his bronchitis, and this sensitization results in periodic attacks of labored asthmatic breathing.

There is some cough and some bronchitis associated with all asthmas. Old asthmatics eventually develop chronic bronchitis. Then breathing is more or less labored at all times, and periodically it becomes definitely asthmatic. This is a second method of development of bronchial asthma. Persons with chronic heart disease with poor compensation are short-winded, and breathe with difficulty

at times. This may be pronounced enough to merit the term *heart asthma*. Bright's disease occasionally produces the same effect.

There is a form of asthma which generally goes by such names as *hay fever* and *rose cold*. In this disorder, the nose runs freely, the eyes are red and watery, and there may be labored breathing. Cough is occasionally present. In this group of disorders, the affected membranes have become sensitized to certain pollens, such as those of ragweed, grass, and trees. There is a similar disorder which results from being sensitized to the dandruff and hair of cats, horses, dogs, and other animals, or to feathers, or to certain foods. Cough is not a prominent feature in this type of asthma, but if it continues long, bronchitis may develop and persist, and bronchial asthma may become associated with hay fever as a part of the clinical history of the same person.

Treatment. The basic treatment of asthma of the several varieties is to find the cause, and avoid it when possible. For this purpose skin testing is done. It can sometimes be accomplished by "trial and error," that is, by eliminating certain foods from the diet and noting the effect, by avoiding certain annuals, and by changing climate or habitation.

For relief, adrenalin is used, as are also certain other anti-spasmodics. Certain leaves are burned, and the smoke inhaled with some possible benefit. In some places, the prevention of hay fever through the cutting of weeds is attempted. W.A.E.

Related Subjects. The reader is referred in these volumes to the following subjects:

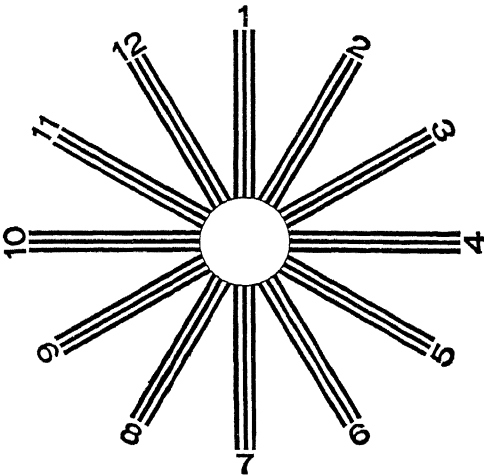
Adrenalin	Hay Fever
Bright's Disease	Serum Therapy
Bronchitis	Proteins

ASTIGMATISM, *as tig' ma tiz'm*, an irregularity in the shape of the surface of the front part of the eye which causes the image on the retina to be misshapen. This condition of the eyeball may be congenital, it may be inherited, or it may be acquired. It produces poor vision, results in eyestrain, but can be corrected by glasses; however, the glasses must be fitted by means of a competent examination.

If the diagram shown here is held at a distance of eighteen to twenty-four inches and closely observed with each eye separately, a diagnosis of astigmatism in one or both eyes can be strongly suspected or can be accepted as absent on the basis of the appearance of the lines. A normal eye will see the lines all of the same shade of black and with the same sharp edges. An astigmatic eye will see certain lines as indistinct, blurred or lighter in shade. The location of the blurring indicates the part of the eyeball which is astigmatic.

Proper fitting of glasses requires a closer examination of the eye with appropriate instruments.

W.A.E.



A PRACTICAL TEST

This chart, drawn to larger scale, is widely used in testing eyes for astigmatism. If all the lines do not appear equally black, astigmatism is likely to be present, in greater or less degree.

ASTOR, LADY NANCY LANGHORNE (1879-), an American who became distinguished as the first woman to be elected to membership in the British House of Commons. She was born in Virginia, one of eleven children of the prominent Langhorne family. In 1897, she was married to Robert Gould Shaw of New York, from whom she secured a divorce in 1903. Three years later she was married to Waldorf Astor, of the New York Astor family, who had become a naturalized Briton, a member of Parliament, and the owner of powerful English newspapers, and who succeeded to the peerage in 1919 as Viscount Astor. See **ASTOR (Family)**.

Lady Astor became absorbed in political affairs in her husband's former constituency in Plymouth, and in 1919 announced herself a Parliamentary candidate of the Coalition-Unionist party; she was elected, and since then has been victorious at each succeeding election. In Parliament the causes which have commanded her earnest support are those relating to the needs of English women and children, and she has also advocated prohibition. She is the mother of five children.



LADY ASTOR

Photo: U & U

ASTOR FAMILY, a family of American capitalists, in an earlier day called the "landlords of New York City," because the founder of the family invested most of his fortune in real estate, and its gradual rise in value placed his descendants among the richest persons in the United States. They are America's nearest approach to the typical European hereditary, landowning families. Though the family fortune was founded in a commercial enterprise, by the original John Jacob Astor, it was soon tied up in real estate, and each succeeding generation has added to rather than sold the land held by the family.

John Jacob Astor (1763-1848) was born in the small village of Waldorf, near Heidelberg, Germany, where his father was a butcher. The son emigrated to New York in 1783, and almost immediately began to trade in furs, even preparing them for market with his own hands. So shrewd and industrious was he that in six years he had acquired a fortune of nearly \$200,000. His business gradually expanded, and in 1811 he founded Astoria, Oregon, as a permanent station for regular trading with the Indians. In spite of the War of 1812, during which Astoria was sold (see **OREGON**), he prospered, and at his death had commercial connections in each part of the globe. Most of his fortune of \$30,000,000 he invested in real estate in New York, much to the scorn of his friends, who thought him crazy because he bought farms outside the limits of the city. But the land which he bought by the acre in the vicinity of the present Broadway and 42nd Street is now sold and leased by the square foot, and a square foot is worth several times the price he paid for an acre. He bequeathed \$350,000 to the city for a public library, known as the Astor Library. See **OREGON** (Exploration and Early Settlement).

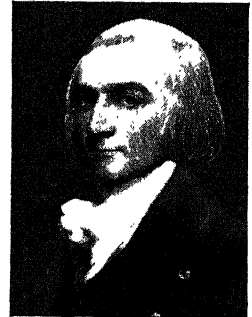


Photo: Brown Bros.

JOHN JACOB ASTOR

William Backhouse Astor (1792-1875), son of the first John Jacob, inherited most of the estate, and by judicious management doubled its value. He contributed large sums to the Astor Library, founded by his father, and also bequeathed to it \$250,000 in money and \$200,000 worth of books. His two sons were John Jacob (1822-1890) and William (1830-1892), who upon the father's death divided his estate into equal shares.

John Jacob Astor (1822-1890), third of this name, was the eldest son of William Backhouse Astor. He was educated at Columbia, Göttingen, and Harvard universities, taking the course in law at the last institution to qualify himself for the management of the Astor estate. Like his father and his grandfather, he gave liberally to the Astor Library and to many charities. He was a colonel on McClellan's staff in the War of Secession, and was far prouder of his military record than of any other achievement in his life.

William Waldorf Astor, Baron (1843-1919), son of the preceding, was the first of the Astors to abandon the United States as his home; he removed to London in 1890, and in 1899 became a British subject. Before he went to England, he served in the New York assembly for two terms, and from 1882 to 1885 was United States minister to Italy. On the death of his father he became head of the family and the possessor of an estate estimated at \$200,000,000. In England he became the owner of the *Pall Mall Gazette*, one of the leading Conservative newspapers. In 1917 he was created a baron by King George V.

Waldorf Astor, son of the above, became a British subject, and is the husband of Lady Nancy Astor (which see).

John Jacob Astor (1864-1912), fifth child of William Astor and grandson of William B. Astor, was one of the ablest members of this remarkable family. After graduation from Harvard, in 1888, he traveled extensively, and then devoted most of his time to the management of the estate. He owned many notable buildings in New York, including the Saint Regis, the Knickerbocker, and the Waldorf-Astoria hotels, all built on lands purchased by his far-seeing great-grandfather. He was known as the inventor of numerous mechanical devices, including a bicycle brake, a machine for developing peat deposits, and an improved form of turbine engine for ships. In 1898 at his own expense he equipped a battery for service in the Philippines, and he himself served on General Shafter's staff in Cuba. He took part in the Battle of Santiago and was chosen by Shafter to deliver the official notice of the Spanish surrender to the Secretary of War. He lost his life by the sinking of the steamship *Titanic*, April 15, 1912; his wife of a few months was among the few rescued, and a short time later a son was born.

William Vincent Astor (1891-), son of John Jacob Astor, inherited his father's vast estate. He was educated at Harvard University. In 1914 he married Helen Dinsmore of Staatsburg, New York. During the World War, he served as lieutenant in the United States navy and saw active duty in European waters. He became director in many industrial enterprises in which his vast fortune is invested.

ASTORIA, ORE.
See OREGON (back of map).

ASTRAEA, *as tre'-ah*. See ASTEROIDS.

ASTRAGALUS, *as trag' a lus*. See FOOT (in anatomy).

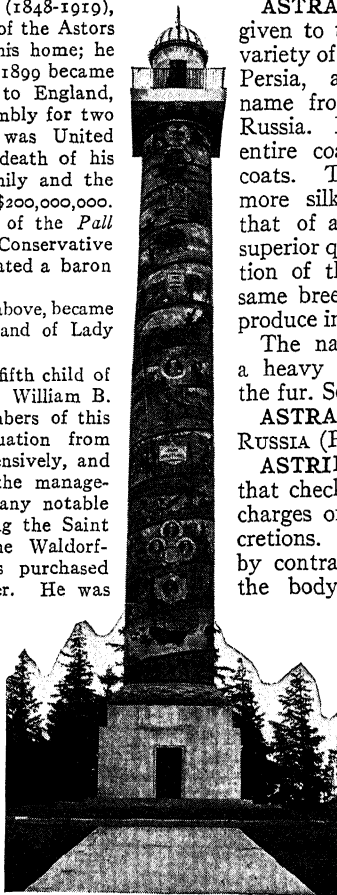


Photo: U & U

TO THE MEMORY OF JOHN JACOB ASTOR
This carved stone column of artistic design, surmounted by an observatory, has been erected at Astoria, Ore., the town founded by the first representative of the family in America.



Photo: Brown Bros.

WILLIAM VINCENT ASTOR

ASTRAKHAN, *as' tra kan*, the name given to the fur or wool of a particular variety of lamb bred in Southern Russia, Persia, and Afghanistan, deriving its name from the town of Astrakhan in Russia. Its curly, glossy fur is used for entire coats or as trimming on cloth coats. The wool is of finer texture, more silky, and is more durable than that of any other variety of lamb. Its superior qualities are attributed to the action of the climate, as animals of the same breed, exported to other countries, produce inferior wool.

The name *astrakhan* is also applied to a heavy pile fabric made in imitation of the fur. See FUR AND FUR TRADE.

ASTRAKHAN. See CASPIAN SEA; RUSSIA (Principal Cities).

ASTRINGENT, *as trin' jent*, a medicine that checks or diminishes excessive discharges of blood, mucus, and other secretions. Astringents exert this effect by contracting the tissues and canals of the body. There are two classes of astringents used by physicians, namely, vegetable and mineral. The vegetable astringents all contain tannic and gallic acids, catechu, kino, oak bark, and rhatany. Mineral astringents include mineral acids, zinc, iron, lead, silver, nitric and hydrochloric acids, alum, limewater, and chalk. The ailments treated by use of astringents include diarrhoea, sore throat, hemorrhage, and various mucous discharges of body cavities. See ADRENALIN.

ASTROLOGY is the predecessor of astronomy, in that its pursuit required the accumulation of a considerable range of astronomical data; this aspect was known as *natural astrology*. But the motive that supported the inquiry was that of predicting and controlling human fate; this phase was known as *judicial astrology*. The two interests were more detached than was true of the (later) relations of alchemy and chemistry. The superstitions of astrology were comprehensive. Its practice included the determination of fortunate days for various enterprises; fixing the site of temples; prophesying the issue of events; prescribing medicines according to astrological affinities; diagnosing disease by means of the relations of the several parts of the body (or the vital system) to the positions of the planets; and most prominently, the casting of horoscopes (see HOROSCOPE).

All these practices were determined by the

zodiac, which was the name given to that part of the heavens containing the paths of the sun, moon, and principal planets (see ZODIAC). It was divided into twelve portions, by reference to the constellations in the several divisions. Thus, the Ram (Aries) leads ("the first house"), and is the sign under which the child is born. The sign of Jupiter is the astrological origin of the R which still heads the physician's prescriptions. It should be observed how naturally the several "occult" sciences worked together; the course of events, the treatment of disease, the guidance of the affairs of life were regulated by notions which were at once alchemistic and astrological.

The underlying conception of astrology is that the courses and appearances of the heavenly bodies exert a "moral" or prophetic influence upon the earth and its inhabitants. Divination and prediction were its chief functions. For this purpose an elaborate system was devised; for the data were limited to the relations of the position of sun (moon), planets, and constellations. To bring these into relation to human fate, each of the four ages of man—childhood, youth, adult life, and old age—were assigned three divisions (houses) in the zodiac, by giving each an ascendant, a dominant, and a declining "house." By distributing the several human virtues of qualities or fates, such as content, cowardice, valor, justice, riches, disease, injury, accident, war, business venture, office, death, over the planets and constellations (Jupiter for the jovial, Venus for love affairs, Mars for war, Mercury for business, Leo for courage, Libra for justice, etc.), it was easy to lay out the course of a life's career by means of a horoscope.

The twelve signs of the zodiac were assigned to different portions of the body: Aries (ram) for the head; Taurus (bull) for the neck and the shoulders; the Twins (Hercules and Apollo) for the arms and hands; Pisces (fish) for the feet; specific diseases were thus

predicted and cures prescribed. (The fanciful analogy is readily observed: the ram has a conspicuous head, the bull a strong neck, etc.). The system left room for adjustments in interpretation toward the pleasant fates, especially in casting the horoscopes of kings or nobles—and while occasional successes were heralded, failures or vague issues were naturally ignored. The interest in astrology is centered in the early religious type of conception out of which it grew; as a system of divination, it follows the usual elastic adjustment of sign to fate. It developed such fantastic predictions as that of the end of the earth in 1524 by a flood, because three planets would then meet in the aqueous sign of Pisces; or that if at the time of a theft the "lord of the sixth house" (i.e., the constellation conspicuous in the sixth division of the zodiac) is in the second house, the thief is a member of the family. Astrology rapidly degenerated to fortune-telling and pretense. Its motive was quite unrelated to that which made the later science of astronomy possible.

Astrological notions are treated so fully in these volumes under SUPERSTITION and DIVINATION that this account is limited to the essential features of the system. It is interesting to note how many words—such as *disastrous* (evil-starred)—have their origin in astrological lore.

J.J.

Relating to Various Beliefs. The articles on the following topics, while not bearing on astrology, are of interest in this connection because they, too, deal with pseudo-sciences or superstitions:

Alchemy	Occult
Clairvoyance	Palmistry
Conjuring	Phrenology
Demonology	Physiognomy
Ectoplasm	Psychical Research
Faith Cure	Psychoanalysis
Hypnotism	Spiritualism
Magic	Subconscious
Medium	Suggestion
Mesmerism	Telepathy
Mind Reading	Trance
Necromancy	Witchcraft



ASTRONOMY. Who that has watched the heavens on a calm, clear night, when the canopy of blue seems so thickly gemmed with stars that room could not be found for more, can wonder that the shepherd races of the East were thoughtful men? Guarding their flocks by night in those cloud-

less lands, they must all have felt with David, the shepherd king—

When I consider the heavens, the work of thy fingers,

The moon and the stars which thou hast ordained, What is man, that thou art mindful of him?

Long before David's time, even before Abra-

ham came out of Chaldea 4,000 years ago, the wise men of that nation had made the study of the stars a serious business, and had in a sense laid the foundations of the modern science of astronomy. In the same age, far away in the same continent, the Chinese were also observing the heavens, and at a time not much later, the Egyptians and Greeks became somewhat skilful astronomers.

In those days all men believed as many did in Shakespeare's time that—

It is the stars,
The stars above us, govern our conditions,

and their studies took the form of *astrology* more than of astronomy; that is, they cared more for divining the supposed influence of the stars on individual destinies than for acquiring an understanding of their true nature and relation to the universe (see DIVINATION). But they early discovered the fact that five of the stars were not fixed in the sky as the others seemed to be, but moved in paths like the moon's. These five the Greeks called *planets*, a word which means *wanderers*. The Chaldeans are said, too, to have been able to predict eclipses with accuracy, and to have known that the rotation of the four seasons occupied $365\frac{1}{4}$ days.

Ptolemy, an Egyptian of the second century A.D., outlined the mechanism of the universe as he believed it to be, and the world accepted his views almost as late as our own time. Ptolemy's earth was an immovable globe in the center of the universe; around it revolved a huge hollow sphere in whose walls were set the stars, and inside of which, at different distances, traveled the sun, the moon, and the five planets then known, Mercury, Venus, Mars, Jupiter, and Saturn. As we watch the Great Dipper slowly turn about the North Star, it is easy to understand how Ptolemy thought as he did, though we know now that it is the spinning of the earth on its axis that causes this effect.

Early in the sixteenth century, Copernicus, a Pole, became convinced that the doctrines of Ptolemy were almost entirely wrong, and that the sun is the center about which the earth and the planets revolve. But, as in the time of Pythagoras, who had come to the same conclusion a little more than 2,000 years earlier, people were not ready to believe such teachings. Within the next two centuries lived four great astronomers, Tycho Brahe, Galileo, Kepler, and Newton, who made many valuable observations and discovered several of the fundamental laws, the most vital of which is the one known as Newton's Law of Gravitation (see NEWTON, ISAAC; also EINSTEIN'S THEORY OF RELATIVITY).

What the Heavens Contain. Because of the faithful work of these men and those who

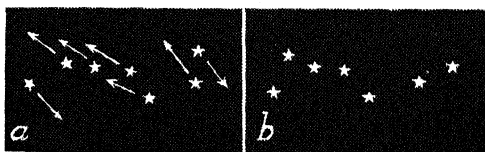
have followed them, astronomers now know to a surprising extent how the material universe is arranged. We no longer think, with Milton, that the Creator—

made the stars,
And set them in the firmament of heav'n,
T'illuminate the earth,

for we know that our own world is a very, very small part of the universe which we can see, and that beyond the range of our eyes in every direction there are suns upon suns, almost innumerable.

The earth is a planet like the five which the ancients knew, like Uranus and Neptune, discovered in modern times, and like the numerous little earths called *asteroids* or *planetoids*, many of which are yet undiscovered. All the planets travel around the sun, whirling on their axes as they go. Together with their moons, or satellites, they make up our solar system. Mercury, the innermost planet, has a year only as long as three of our months, while Neptune, the farthest out, passes around the sun only once in 164.8 of our years. Each satellite revolves about its planet much as the earth does about the sun, but several of them circle in the opposite direction. Saturn is known to have nine moons, possibly ten, and Jupiter nine, one of which takes two years and two months to complete each journey. One of the moons of Mars is only five miles across.

But the sun is not, as even Copernicus thought, the center of all creation. It, too, spins on its axis, once in twenty-five days, and is carrying the solar system through space at a rate of about twelve miles a second, about two-thirds as fast as the earth moves in its annual journey. This we know, because the stars in one direction are gradually spreading apart (just as the two sides of a road open in front of you as you speed along in an automobile), while in the opposite direction they are

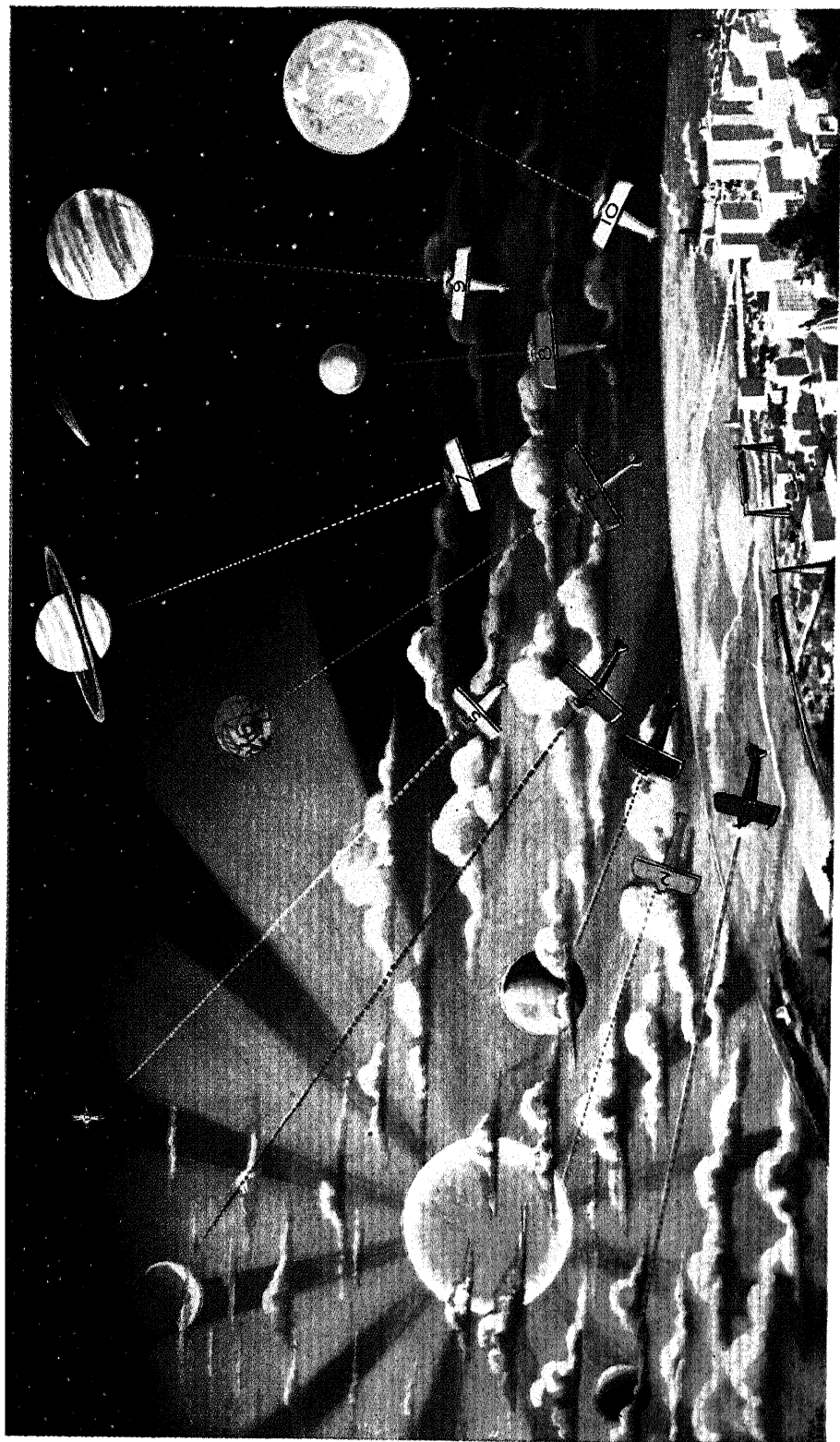


EVEN THE "FIXED STARS" MOVE

(a) The "Big Dipper" and the direction in which its stars are moving. (b) As the "Dipper" will appear in about 100,000 years.

moving together; and because of displacements of lines in stellar spectra due to motions in the line of sight.

All of the stars that we see, the planets alone excepted, are suns, some of them hundreds of times as big as our sun, which is itself 864,000 miles in diameter. Many of them, perhaps all, have companions, some bright



The Immensity of Space. Consider it possible to journey from the earth to other heavenly bodies in an airplane traveling 100 miles an hour. The trip to the several destinations would be completed in time as follows, with fractions of years omitted: (1) To Mercury, 65 years; (2) the sun, 106 years; (3) Venus, 30 years; (4) Uranus, 1,954 years; (5) Betelgeuse, a star, 114 light years [see page 470]; (6) Mars, 55 years; (7) Saturn, 932 years; (8) Neptune, 3,081 years; (9) Jupiter, 445 years; (10) the moon, 100 days. The figures are based on distances at the time the bodies are nearest the earth.

suns, others dark globes which we cannot see, with which they spin about as though they were two stones chained together. The period of revolution has in some cases been determined, and in others it can be estimated with considerable accuracy. The great star known as Castor has a companion with which it completes a revolution once in several thousand years; the two are of course immense distances apart, yet to our naked eyes they seem as one star. No doubt numbers of the *binary systems*, as these doubles are called, require an even longer period to turn about.

[The reader will find a detailed account of the motions of the stars in the article *STAR*.]

Besides the sun, the moon, the planets, and the stars, there are three types of heavenly bodies.

The first type, *meteors*, or falling stars, most of us have seen. They make such a bright trail through the skies that it is hard for some people to believe that they are really very small, sometimes only grains of dust. Meteors move about the sun in streams, one of which is now and then crossed by the earth, causing myriads of the tiny bodies to be attracted by it. When they reach our atmosphere, perhaps 100 miles above us, they are heated to a temperature of thousands of degrees, and only then do they become visible.

Comets are not so frequently seen as meteors. They consist of swarms of loose particles and gaseous matter. The conspicuous ones develop long, feathery tails, which always extend away from the sun. Some of them journey about through space, coming within sight of our earth, then passing on to far-off regions, never again to be seen. However, it is now thought by many astronomers that most of the comets confine their travels to our own solar system, reappearing at regular, though in most cases extremely long, intervals. Halley's comet, the best-known of them, visits our skies every seventy-five years; its last appearance was in 1910 (see *COMET*).

Nebulae, unlike either meteors or comets, do not come near our corner of the universe. In general, they are huge masses of gaseous or partly gaseous matter, or vast clouds of dustlike particles. One of the largest nebulae known is at the central star in the sword handle of the constellation Orion, described below. It is generally believed that our sun and other stars have been evolved from nebulous matter. Most numerous of the so-called nebulae are those of spiral conformation, but the spiral nebulae are believed to be far-distant systems of stars (see below), condensed out of true nebulous matter.

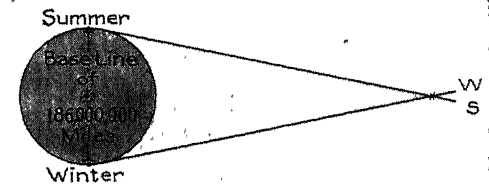
Distances That Defy the Imagination. Suppose you were to attempt to construct a diagram of the position of the earth and the sun,

moon, and stars in such a way as to show their distances from one another and their relative sizes. If you represented the earth's diameter of 8,000 miles by a small pinhole, how large a sheet of paper would you need for your diagram?

First of all, you would mark the moon, a mere pin prick, five-eighths of an inch from the earth. The sun, you would represent by a circle over two inches in diameter, placed more than nineteen feet from the pinhole! You have already exceeded the limits of a sheet of paper, yet you have only started your diagram.

If you moved out-of-doors to get more room for your work, you would continue by placing Mercury seven and one-half feet, Venus fourteen feet, and Mars twenty-nine feet from the sun; all these planets are smaller than the earth. Then would come Jupiter, one hundred feet from the sun, but only three-sixteenths of an inch in diameter. One hundred eighty feet away from the sun would be Saturn, not as large as Jupiter; a little more than twice as far would come Uranus, a sixteenth of an inch wide; nearly 600 feet from your starting point would be Neptune, only a little smaller than Uranus.

Consider for a moment that the little pinhole indicates the earth, which seems quite



HOW DISTANCES MAY BE DETERMINED

In summer, the earth is 186,000,000 miles from its winter position. By observing a star from both positions, astronomers learn the angle *WS* and by trigonometry figure its distance. But inasmuch as the nearest star is more than 140,000 times 186,000,000 miles away, there are very few stars whose distance may be found exactly, even with this enormous base line.

a large place if we travel about it, yet in a space of 600 feet, representing nearly three thousands of millions of miles, you have marked only nine globes, most of them too small to be seen. To these could only be added the moons of other planets, and the tiny asteroids. This gives you some idea of the immensity of space, and yet you have only dealt with a half-dozen of the many, many celestial bodies that are seen in the heavens.

Beyond the planets lie the stars. The star group nearest our sun, the first one beyond Neptune that anyone on earth can see, is the double star Alpha Centauri, which is accompanied by a very faint dwarf companion dis-

covered photographically in 1916. Since there is some evidence that the smaller body may be closer to us than Alpha Centauri itself, this companion star has been named Proxima Centauri (nearest of Centaurus). It revolves about Alpha Centauri at a distance of a million million miles. Alpha Centauri is 25 million million miles from our sun, and on the chart it would appear 1,000 miles away from the pinhole earth. At this enormous distance you are just beginning to peep into space. Sirius, the brightest star in the sky, is twice as far as Alpha Centauri; the North Star is probably a little more than one hundred times its distance; Canopus, second in brightness, is perhaps one hundred fifty times as deep in space.

Even then you are only viewing the nearer parts of space. Beyond, stretching to what seem endless distances, are countless stars, all a part of the gigantic stellar system in which our world is, comparatively, a microscopic fragment. But there is more beyond. Astronomers believe that our stellar universe is but one of many thousands of others, all parts of a super-universe, whose dimensions are stupefying to the human mind. The famous spiral nebula in the constellation of Andromeda, which a keen eye can discern in the heavens as a faint cloudy mass, is believed to be one of the nearer of the outside "island universes," and by special calculations astronomers have determined its distance from us. It is so remote that the light we now receive from it started on its way 1,000,000 years ago, though light travels over 186,000 miles a second. This distance is expressed in figures as 6,000,000,000,000,000,000 miles. The faintest spiral nebulae visible through the largest telescopes are believed to be 140,000,000 light years distant. There are probably 2,000,000 of these independent galaxies.

Light Years. It is not easy to talk in terms of billions, trillions, and quintillions of miles, so astronomers measure their distances in *light years*. A light year is the distance light travels in one of our years. We know that light travels so fast that in one second a ray of it could pass around the earth about seven and a half times, or more times than you can move your finger around the end of a pencil in a second. Light takes a little more than a second to reach us from the moon, eight minutes from the sun, and over four hours from Neptune. But the rays from Alpha Centauri travel four years and four months, and it is said to be at a distance of 4.3 light years. The rays which show you the location of the North Star started on their way about five hundred years ago. Some of the stars you seem to see may have ceased to exist several thousand years ago, but the rays which they gave out are still active and are

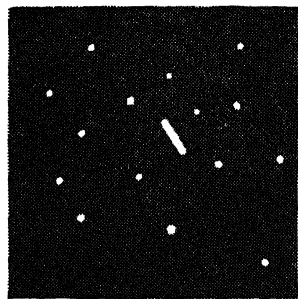
just reaching the earth. Another unit of measurement commonly used by astronomers is the *parsec*. One parsec is equal to about 3.25 light years. Its convenience for measuring vast distances is readily seen when we consider that a parsec is the equivalent of 19 million million miles.

How Astronomers Work. The most striking thing about all this is not that there are such great distances and so many suns and worlds, but that man has been able to learn so much about them. There are two kinds of astronomers, the observers and the mathematicians, and it is said to be seldom that one man combines in himself both characters. Sometimes it is the mathematicians who make discoveries, sometimes the observers.

This is well illustrated in the romantic story of the discovery of the planet Neptune. According to Newton's law of gravity, "Every particle of matter in the universe attracts every other particle, with a force in the direction of a straight line joining the two." Thus the path of each planet is influenced not by the sun only, but by each of the other planets and stars, as well.

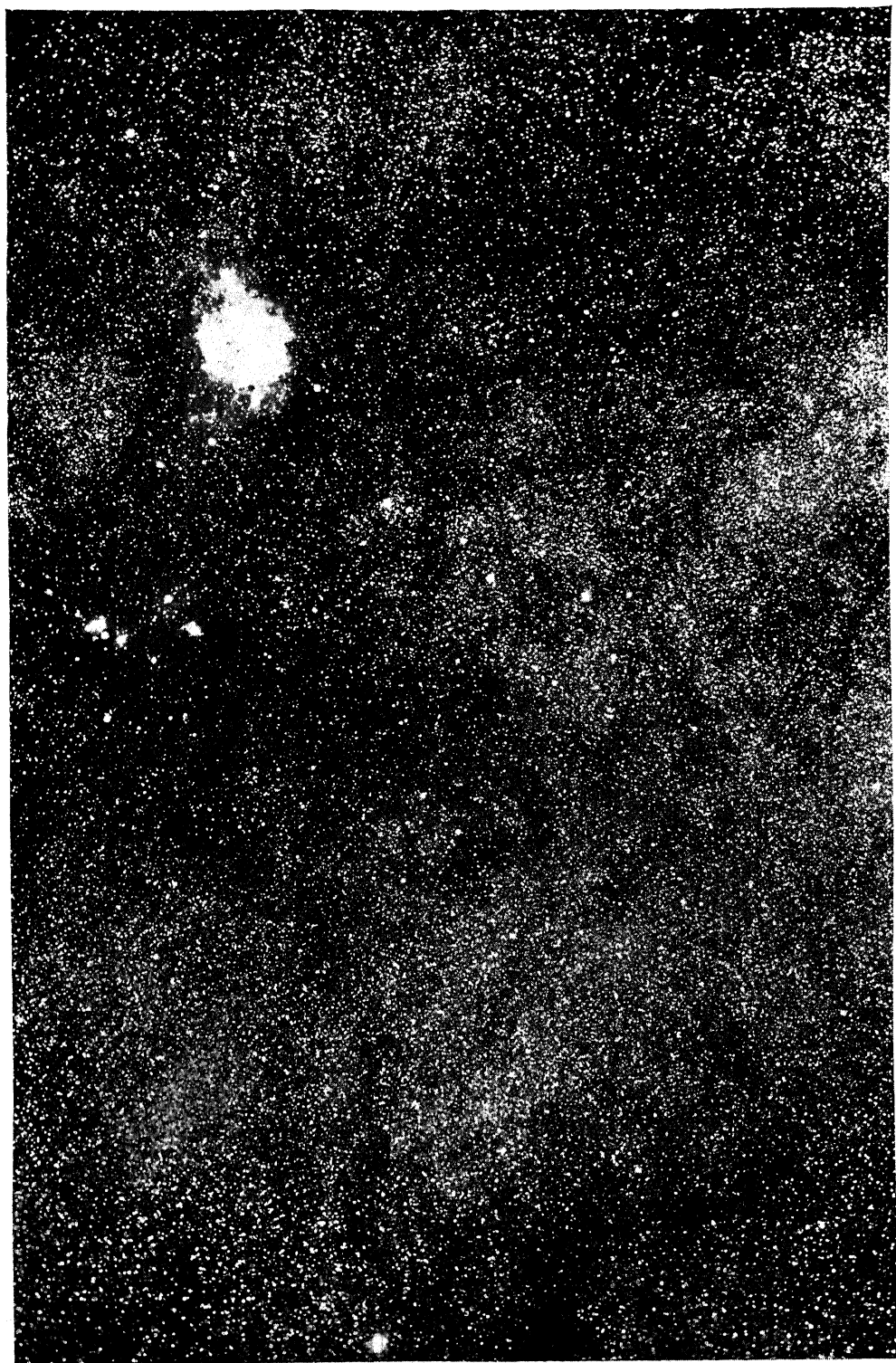
After Herschel's discovery of Uranus, in 1781, astronomers set to work to map its course. They soon found that it did not travel in the path or at the speed which the location and size of the other planets and the sun would dictate, though the variation was so slight that it might easily have been due to errors in calculation.

In 1821, a French astronomer suggested that an unknown planet was influencing Uranus, and in 1843, Adams, a young mathematician at Cambridge University, England, commenced to work on the problem. Two years later he had finished his calculations showing where the unknown planet must be; these he took to the Astronomer Royal, who laid them aside and forgot about them. The next year a young Frenchman, Leverrier, sent a similar set of calculations to the Director of the Berlin Observatory; the very night of their receipt an observer commenced a search for the new planet and found a small star which did not appear in his maps. This later proved to be the new planet, which was named Neptune.

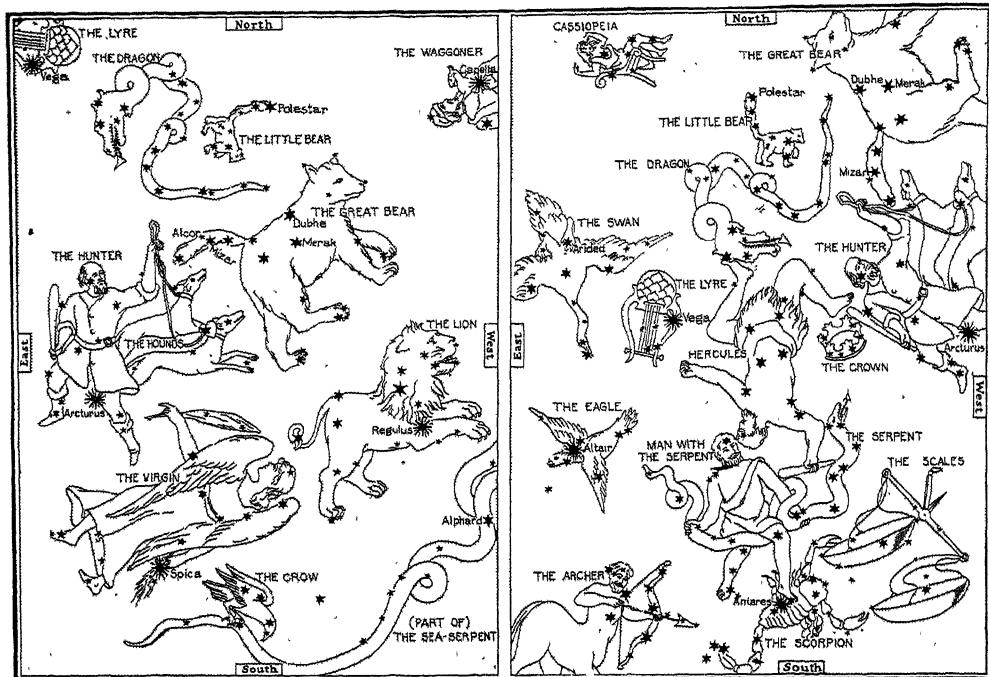


HOW THE CAMERA DISCOVERS
PLANETOIDS

If a portion of the heavens is photographed, the telescope being moved by clockwork to keep pace with the fixed stars, a planet will show as a streak. In this way hundreds of tiny worlds have been found.



A Section of the Milky Way. A selected region; photograph reproduced from Barnard's Atlas, published by the Carnegie Institution of Washington.



THE HEAVENS IN SPRING AND SUMMER

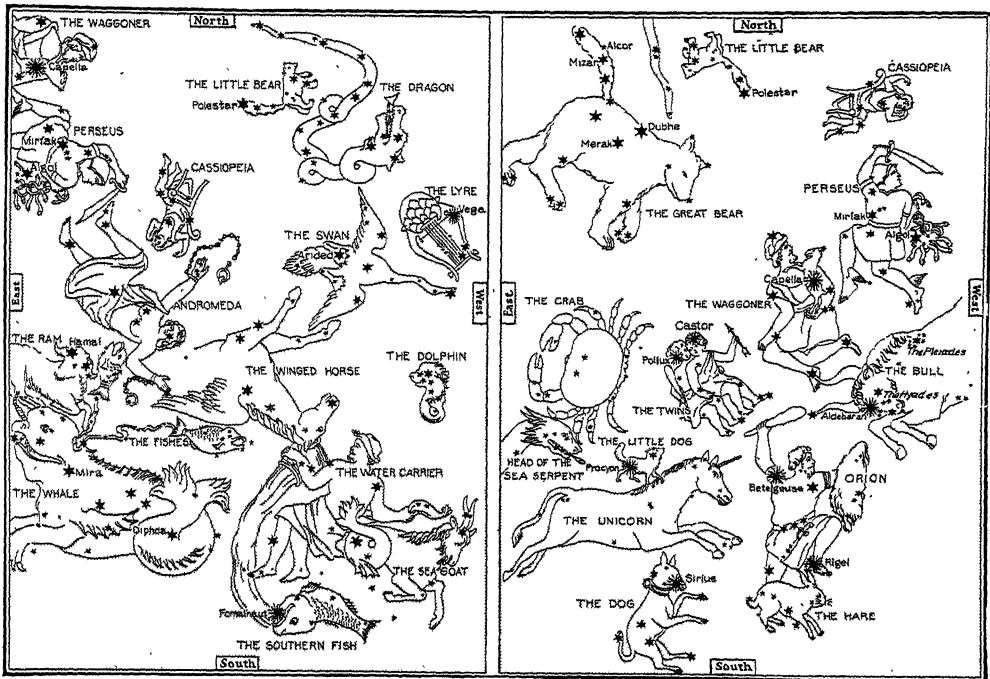
In the meantime, the English Astronomer Royal had heard of the work which the Frenchman claimed to have done; he got out the papers which for a year he had neglected, and, following the directions contained in them, an English observer discovered the planet just a week after his Berlin colleague. So it was that the great Neptune was actually found by two mathematicians who had no apparatus to observe the stars.

Three instruments have meant more to the progress of astronomy than all others. The first is the *telescope*, which Galileo introduced to the field of astronomy; the others are the *camera* and the *spectroscope*, made helpers in the nineteenth century. Sometimes all three instruments are combined into one, the *spectrograph*. More recent than any of these is the *interferometer*, by which star diameters are measured (see STAR; INTERFEROMETER).

When a photograph is to be made through a telescope, the sensitive plate is simply inserted in the focus of the objective lens. No other lens is needed than that of the telescope, unless the objective is a visual one, in which case a photographic correction lens is sometimes used. But there are other difficulties. The movement of the stars about the North Star, caused by the rotation of the earth, is of course magnified in the telescope, and to prevent a photograph from becoming blurred it is necessary to attach clockwork which will keep the telescope pointed in the proper

direction. For very delicate work, even this machinery is not sufficient. Many photographs require several hours' exposure, and all this time an observer must sit with his eye to a parallel telescope, making whatever minute adjustments are necessary. At the end of his instrument is a cross made of spider's web, which is much finer and smoother than hair; at the start a star is focused exactly at the center of the cross, and if it appears at any time to move the slightest distance in any direction, the observer brings it back by an adjustment.

The tasks assumed by modern astronomers are various. Some devote themselves to special researches on the sun, the moon, or one of the planets. Others are doing fundamental work on the positions of these objects, or are mapping specified sections of the heavens, thus providing reference points for other work and facilitating the discovery of new stars, asteroids, and comets. Many more are busy with the distant stars or the nebulae, determining their velocity, their distance, or their composition. Often what appears to the unaided eye to be a single star is shown by the telescope to be two or more, sometimes one behind the other and having no mutual connection, at other times forming a binary system. Again, what appear through even the most powerful telescopes to be single stars are proved by the spectroscope to be members of binary systems. Much of the study of nebulae and of



THE HEAVENS IN AUTUMN AND WINTER

dark stars, of which one astronomer estimates there are four for every bright one, is part of the attempt to discover the origin of worlds, including our own. It takes so many ages for a world to be formed that of course no series of observations can be made of any one case, but by comparing stars of all sorts, from "babies" to "old men," astronomers will in time reach correct conclusions.

The Stars and Their Names. To gain the greatest pleasure from the stars, we should make them our friends. We cannot hope to know them all, for there are many millions, but we can easily learn to recognize many. If the stars were arranged in regular order, like those on many national flags, it would be quite a task to distinguish them, but fortunately they are not. Instead, they form many irregular groups, which we call *constellations*. From very early days men have given names to the constellations, mostly because of some real or fancied resemblance to animals or to characters in mythology.

The best way to become acquainted with the constellations and their principal stars is to compare them with the halftone maps accompanying this article, which show the best-known figures in the heavens of the northern hemisphere at each of the four seasons, between eight and nine in the evening. In using one of the maps, hold it over your head, so that east, west, north, and south will be in their proper positions.

The Heavens in Spring. Suppose you are looking at the heavens in spring. A little to the north of the zenith (the point directly over your head) is one group of stars which nearly everyone knows—the Big Dipper. On the map it forms the tail and part of the body of the Great Bear. From the Dipper it is always easy to find the North Star, or polestar, for it is almost directly in line with the stars Dubhe and Merak, which form the front of the bowl. The polestar is the tip of the Little Bear's tail, or, as others have it, the end of the handle of the Little Dipper. East of the Little Dipper is Draco, the Dragon, whose head is marked by four stars, and whose tail winds around nearly to the Big Dipper. The star between Mizar of the Big Dipper and the outer star of the bowl of the Little Dipper was our North Star 4,000 years ago, but the constant change in the direction of the earth's axis, due to precession, has brought the celestial pole gradually to its present position near Alpha Ursae Minoris, the present polestar. After 12,000 years the polar star will be Vega, the bright star northeast of the Dragon's head. See ECLIPSE; PRECESSION OF THE EQUINOXES.

Vega, it will be noticed, is much brighter than the stars about it. It is called a *first-magnitude star*, for astronomers have a way of classifying stars according to the amount of light they give out (see MAGNITUDE). There are but twenty of the first magnitude, and only three of them—Sirius, Canopus, and Alpha

Centauri—are brighter than Vega. Next to Vega in brightness is Capella, west of the pole-star, and the next again is Arcturus, which may be found by extending the curve on the Big Dipper's handle toward the east and south. Arcturus is one of the large known suns; its diameter is about twenty millions of miles. Two other first-magnitude stars will be found in the heavens at this time—Spica, in the constellation of the Virgin, and Regulus, to be found at the end of the hand of the Sickle, in the Lion.

The Heavens in Summer. In the second of the maps will be noticed several new constellations. In spring they could have been seen only after midnight. Cassiopeia, in the northeast, is easily recognized by its resemblance to the letter *M*. Scorpio, the Scorpion, in the south, is another constellation not difficult to find. Its brightest star, Antares, the largest star known, is red in color. Near the eastern horizon is Altair, a star which gives nine times as much light as our sun. It is only sixteen light years away from us, and is traveling in this direction about twenty miles in one second, and after 150,000 years will occupy the same place in the universe that our solar system does now. But by that time we shall be millions of millions of miles away, in another part of illimitable space.

The Heavens in Autumn. At this time of the year, the star of the south is Fomalhaut, which may be recognized as the first-magnitude star at the end of the wavy line which represents the water flowing from the jar of Aquarius, the Water Carrier. The constellation Andromeda, toward the east, contains one of the two nebulae which may be seen without a telescope. This nebula is just north of the second-magnitude star which marks Andromeda's waist. It is now supposed to be a far-away universe of stars.

The star which marks the foot on which Andromeda stands is proved by the telescope to be three stars, one orange, one green, one blue. Algol, on the eastern horizon in Perseus, was known in olden times as the Demon, or the Winking Star. Ordinarily, it is of the second magnitude, but for eighteen minutes on every third day it sinks one degree in magnitude. The wonderful spectroscope has proved to us that this variation is caused by a fainter companion star which passes in front of it, eclipsing part of its light at definite, regular intervals.

The Heavens in Winter. No other constellation contains so many bright stars as Orion, the Warrior, seen in the south in winter time. Two of them are of the first magnitude, Betelgeuse, dull orange-red, and Rigel, seventh in brightness among all the stars. In the sword of Orion may be seen the nebula mentioned above. Sirius, the Dog Star, is by far the

greatest light-giver of all in the heavens, and may be seen both north and south of the equator. Procyon, the Little Dog Star, is next to Rigel in brightness. Aldebaran, a rosy star which forms the flaming eye of the Bull, is one of those which is moving farther away from us. It is directly in the path of the moon, by which it is often hidden. Its companion star may be seen with a telescope. The Pleiades, at the back of the Bull's neck, are a group of tiny twinklers, of which from six to eleven may be seen by the naked eye, though there are actually about 3,000. Photography shows them to be wrapped in a nebulous cloud, and they are thought to be closely related stars which are developing from it. In spite of their faintness, many of them are a number of times brighter than our sun, and are separated from each other by several light years. In ancient times, the Pleiades were supposed to be Atlas, his seven daughters, and their mother, and there is a legend of a lost Pleiad. Castor and Pollux, the Twins, are of interest because it is thought that Castor was formerly the more brilliant, though now less bright than Pollux. Castor is a green star.

Conspicuous in the sky at all seasons is the broad luminous band known as the Milky Way, or Galaxy. To us it seems but a softly lighted cloud, but to the astronomer with a very powerful telescope it shows itself as a multitude of stars. It is, in fact, the central plane of our own stellar system, which is believed to be a huge, flattened, disk-shaped aggregation of stars. Optically, the Milky Way is the projection on the sky of the densest section of the stars, as it appears to us looking at it from within. The sun is in the center of a local cluster of stars. It is located somewhat north of the Galactic plane, and some estimate it at about 60,000 light years from the center. Because we are north of the plane, the circle formed by the Milky Way does not coincide with the circle that cuts the celestial sphere exactly into halves. (See illustration of a section of the Milky Way, page 471.)

The Planets. Of those worlds which, like our own, move about our sun, Venus, Jupiter, and Mars are most familiar to us. Venus was Hesperus, the evening star of the ancients, and Lucifer, the morning star as well, for people did not know the two were the same. Jupiter is nearly as bright as Venus, and Mars may be distinguished by its redness. All these "wanderers" appear at different times in different months, because their periods of revolution about the sun do not correspond to our own. Saturn is a bright, somewhat yellowish star. Uranus may seldom be seen without a telescope, being just at the limit of visibility, and Neptune is never visible to the naked eye. Mercury is difficult to see because of its nearness to the sun.

The Contribution of Astronomy to Human Welfare

Astronomy is the science of the stars. The word means *classifying or arranging the stars*. In the earliest days, before writing was common, the names of the stars and constellations probably were collected by the priests from the tales of travelers. Chronology (or the reckoning of long periods of time) and the calendar (dealing with periods of time within a year) have been based upon observations of the sun, moon, and stars.

The beauty and mystery of the stars and planets must have appealed quite as strongly to primitive men as they do at present, but people of intelligence no longer have any fear that human welfare is affected by the positions of the planets among the stars or of the stars themselves on birthdays or other special dates. The Greeks and other early peoples let their imaginations fill the skies at night with fanciful creatures, with heroes and heroines, with animals, and even with rivers. Many of these constellations (with their mythical names) have been preserved to this day, and a star is even now designated by a letter of the Greek alphabet followed by the name of a constellation (usually in Latin). The brightest stars had names of their own, like Sirius, the dog star; Arcturus, Antares, and Aldebaran. Many of these names of single stars were assigned by Arabic scholars. When hardy mariners began to sail around the globe, they found many groups of stars too far south to be seen in the early home of the race around the Mediterranean Sea. These southern constellations were, therefore, named in quite recent times by navigators and by astronomers.

Although one of the oldest of the sciences, astronomy plays a more important part in everyday life than most people realize.

(1) The time of day shown by our clocks and watches, which is so important in the business and social life in all civilized countries, is determined from observations of the stars made with suitable instruments by astronomers and transmitted all over the world by radio, by telegraph, and telephone, and by the signals of clock towers or by whistles.

(2) The accurate fixing of north, south, east, and west directions on the earth is also done by the aid of the sun and stars. The boundary lines between countries or states is often legally defined by parallels of latitude or meridians of longitude. Since the legal title to farms, and equally to city lots, is referred back to some parallels and meridians on the earth, which can be established only by observing the stars and sun, it is evident that we buy and sell land in the last analysis by astronomy.

(3) Navigation upon the sea or even travel in unexplored regions of the earth is made possible and accurate only by the proper ob-

servations of the sun and stars. The mariner's compass is, of course, of much service at sea and on land, but it does not point toward the true North or South Pole, but toward the magnetic poles, which are several hundred miles from the true poles. A correction must, therefore, always be applied to the compass, according to charts based on astronomical observations. The error of the compass at a given place also varies irregularly from year to year, and it can be checked only by the heavens.

(4) The precise dating of the season, which depends upon the position of the sun or stars in the sky, must be founded also upon the observations of astronomy.

(5) Chronology in the ancient past, as we have seen, depends upon records that have been made of astronomical events, such as eclipses of the sun and of the moon, and the circuits of the planets around the sun, or by the appearance in the sky of comets, which often aroused much fear among the superstitious.

Since the spectroscope shows that our bodies are composed of the same elements as are the most distant stars, we have a right to feel that we are kindred in substance to the stars, and that by birthright we are full citizens of the great universe. E.B.F.

Related Subjects. To the reader interested in astronomy, the following list of articles on that subject contained in these volumes will be most helpful:

GENERAL

Apsides	Observatory
Aurora Borealis	Occultation
Calendar	Parallax
Conjunction	Perihelion
Corona	Perigee
Degree	Perturbations
Eclipse	Right Ascension
Ecliptic	Seasons
Einstein's Theory	Sidereal Time
Equinox	Sky
Halo	Solar System
Horoscope	Solstice
Light	Spectrum Analysis
Magnitude	Transit
Nadir	Tropics
Nebula	Universe
Nebular Hypothesis	Zenith
Node	Zodiac
Nutation	Zodiacal Light

HEAVENLY BODIES

Algol	Comet
Antares	Constellation
Aquarius	Double Stars
Arcturus	Evening Star
Aries	Fixed Stars
Asteroids	Gemini
Auriga	Harvest Moon
Bear, Great	Jupiter
Betelgeuse	Leo
Boötes	Libra
Cancer	Mars
Canis Major	Mercury
Capricornus	Meteors
Cassiopeia	Milky Way
Centaurus	Mira

OUTLINE AND QUESTIONS ON ASTRONOMY

Outline

I. Definition

II. How It Developed

- (1) Among the Chaldeans
- (2) Among the Chinese
- (3) Among the Egyptians
- (4) Among the Greeks
- (5) Contributions of modern astronomers

III. How Discoveries Are Made

- (1) By observers
- (2) By mathematicians
 - (a) Discovery of Neptune

IV. Astronomical Instruments

V. The Solar System

- (1) The sun
 - (a) Size
 - (b) Distance from earth
 - (c) Not center of universe
 - (d) Composition
 - (e) Movements
 - (f) Importance
 - (g) Gravitation
 - (h) Satellites
 1. Earth
 - a. Size
 - b. Form
 - c. Movements

d. Atmosphere

e. Satellite—the moon

2. Other planets

- a. Number
- b. Location
- c. Movements
- d. Constitution
- e. Appearance

(2) Nebular Hypothesis

(3) Other theories

VI. Other Heavenly Bodies

- (1) Stars
 - (a) Number
 - (b) Size
 - (c) Distance from solar system
 - (d) Constitution
 - (e) Double stars
- (2) Meteors
- (3) Comets
- (4) Nebulae

VII. Popular Phases

- (1) The heavens in spring
 - (a) Constellations
 - (b) Bright stars
 - (c) Planets
- (2) The heavens in summer
- (3) The heavens in autumn
- (4) The heavens in winter

Questions

How long would it take the earth, at the rate it travels in its orbit about the sun, to reach Alpha Centauri?

Does the sun in its journey through space go faster or not so fast as the earth?

If the earth whirled about on its axis twice as fast as it does at present, what would be the result?

Show by means of a quarter and an electric-light bulb how it is possible for the moon to cause an eclipse of the sun, which is so much larger.

How can it be possible that we see stars which no longer exist?

If you can see a star millions of miles away, why can you not see a meteor two hundred miles away?

How long would it take you in an airship going one hundred miles an hour to make the round trip to the moon?

What did Shakespeare mean when he made Cassius say:

The fault, dear Brutus, is not in our stars,
But in ourselves, that we are underlings.

What legend accounts for the fact that Orion seems to be pursuing the Pleiades in the sky?

How long is a year on Mercury? A day?

OUTLINE AND QUESTIONS ON ASTRONOMY—Continued

Why are some comets seen at stated intervals, while others appear once and never again?

Draw a circle two inches in diameter to represent the earth. How large a circle will represent the moon? The sun? The planet Venus?

Could a blind man make astronomical discoveries?

Is the earth the only planet that has a moon?

If you were lost on the prairies on a starry night, how could you determine directions?

When Caesar said,

But I am constant as the northern star,
Of whose true-fix'd and resting quality
There is no fellow in the firmament,

was he speaking accurately, or has the North Star changed since the beginning of time?

What star used to be called the Winking Star, and why?

Which of the planets are visible in the heavens, and when?

Who were the earliest astronomers?

What was their chief purpose in studying the stars?

What does the word *planet* mean?

To how many heavenly bodies is it applied?

What was the center of the universe according to Ptolemy's system?

Was Copernicus the earliest astronomer who figured out that the views of Ptolemy were not correct?

What heavenly bodies are a part of the solar system?

Are there any bodies conspicuous in the heavens which do not belong to this system?

Which planet is closest to the sun?

Which, as far as is known, is farthest away?

Which is the largest body in the solar system?

Is that same body the largest in the universe?

Which of the planets is known to have the most satellites?

Which are more frequently seen, comets or meteors?

Beyond the farthest planet, what is the nearest heavenly body which may be seen from the earth?

About how far away is the brightest star in the heavens?

What is meant by *light years*? Why do astronomers measure time by means of them?

What is a parsec?

What was there especially interesting about the discovery of the planet Neptune?

Name five astronomers and tell something which each contributed to the science.

Divide the "heavenly bodies" listed in the index into stars, planets, and constellations.

What is meant by the "signs of the zodiac"? Name them.

Name and locate two great observatories.

What is meant by a "binary system"?

Pick out on the charts of the heavens four constellations which have names drawn from mythology and look up the myths in connection with them.

Is it possible that at the present time we can see light from stars which are no longer in existence?

How long a time is required for the light from the sun to reach the earth?

What are the names of the two stars which form the outer edge of the Big Dipper?

How many stars are in the outline of the Dipper?

What star is the tip of the Little Bear's tail?

Moon	Saturn
Neptune	Scorpio
North Star	Sirius
Orion	Southern Cross
Pisces	Star
Planet	Sun
Pleiades	Taurus
Polestar	Uranus
Sagittarius	Venus
Satellite	Virgo

INSTRUMENTS

Camera	Sextant
Chronometer	Spectroscope
Compass	Telescope
Interferometer	Theodolite
Lens	Transit

EMINENT ASTRONOMERS

Barnard, Edward E.	Herschel (family)
Brahe, Tycho	Holden, Edward S.
Burnham, S. W.	Kepler, Johann
Copernicus	Laplace, Pierre S.
Flammarion, Camille	Newcomb, Simon
Galileo	Proctor (family)
Hall, Asaph	Ptolemy
Halley, Edmund	Young, Charles Augustus

ASTYAGES, as ty' a geez. See AHASUERUS.

ASUNCION, ah soon syohn'. See PARAGUAY (Cities).

AS YOU LIKE IT. See SHAKESPEARE (Synopsis of the Plays).

ASWAN, ahs swahn', EGYPT. See EGYPT (Modern Cities).

ASYLUM, a sy' lum, a term applied to various institutions where unfortunate persons suffering from various ailments are cared for; thus, *blind asylum*, *orphan asylum*, *insane asylum*, etc., are expressions frequently heard which carry the meaning in the name. The present tendency, however, is to use the term *hospital* in connection with institutions where the insane receive care and treatment, and *home* for those institutions housing other unfortunates. The building and maintenance of such institutions are provided for either by charitable organizations or by government appropriations.

Ancient Asylums. The name asylum comes from the Greek word *asylon*, meaning *a place safe from violence*, and in very early times the term was applied to those places where persons such as slaves, defeated soldiers, and criminals fleeing from justice or persecution sought refuge. Among the ancient Greeks and Romans, the temples and altars of the gods provided such protection; among the Hebrews, this purpose was served by the cities of refuge described in *Numbers xxxv*, 9-34. This idea of protection by the gods passed over into the Christian Era, and in the time of Constantine the Great the churches were appointed asylums. Criminals so abused this privilege, however, that the *right of sanctuary*, as it was called, was gradually abolished.

Right of Asylum. In the law of nations, the term *right of asylum* means the right of a state to permit those fleeing for proper reasons from other countries to remain unmolested

within its boundaries. Nations make extradition treaties with each other (see *EXTRACTION*), so that the right of asylum may not be used to defeat the ends of justice, as in the case of criminals. Even though the right has been limited to temporary protection of political offenders, it is forbidden by the United States government.

Related Subjects. The reader is referred in these volumes to the following articles:

Blind, Education of the	Deaf and Dumb
Cities of Refuge	Insanity (subhead)

ASYUT, ahs yoot', EGYPT. See EGYPT (Modern Cities).

ATAHUALPA, ah tah wahl' pah, the last ruler of a proud race of Indians, the Incas, who were conquered during the Spanish invasion under Pizarro. Atahualpa became king of Quito in 1529, while his brother Huascar ruled over the kingdom of Peru. In a war between the two brothers, Huascar was defeated and imprisoned, and his kingdom fell into the hands of Atahualpa. In 1532, the Spaniards under Pizarro, by a trick, seized Atahualpa, who to gain his liberty offered to fill the room in which he stood with gold as high as he could reach. The gold for his ransom began to pour in at once, but when he demanded his freedom, Pizarro basely accused the prisoner of plotting against his life. He was condemned to suffer death by fire, and was saved from this torture only by consenting to receive baptism. Pizarro then ordered him to be strangled. See PIZARRO, FRANCISCO; INCA.

ATALANTA, at a lan' tah, a famous Grecian huntress who had declared that she would marry no man unless he could defeat her in a race. After many youths had met death for their failure, Hippomenes overcame her by stratagem and won her hand. The interesting story is told in full in the article MYTHOLOGY.

ATAVISM, at' a viz'm, a term used to explain the appearance in animals and plants of certain special characteristics not possessed by their immediate ancestors, but which were common to remote ancestors. It is improper to use the term *atavism* unless the throwback is to ancestors more than two generations remote. Atavism and reversion, in this sense, become like terms. Hybrids in plants, and the sixth finger or toe in man, are examples of atavism. See HEREDITY; EVOLUTION; HYBRID.

ATCHAFALAYA, ach a fa li' yah, RIVER, an outlet of the Red River and occasionally of the Mississippi, carrying part of the overflow from those streams in times of flood. It flows southward from its source at the Red River, near the central part of Louisiana, and enters the Gulf of Mexico by Atchafalaya Bay. Its length is 220 miles, the greater part of which is navigable by small vessels.

Derivation. The word *Atchafalaya* is an Indian term meaning *lost river*.

ATCHISON, KAN. See KANSAS (back of map).

ATHABASKA, *ath a bas' kah*, an English corruption of the Indian word *Athapescow*, which means a *place of hay and reeds*. The name has been given in turn to a tribe of Indians, to a river and a lake in Canada, to a large district of the Northwest Territories, to a mountain, and to a small village in Alberta. All except the last-named are described below:

Athabaska River, in Alberta, is a part of the great Mackenzie River system. It rises on the eastern slope of the Rocky Mountains; one of its branches starts near Yellowhead Pass, through which the Canadian Northern Ry. finds a way over the mountains, and another rises farther south, in Athabaska Pass, just north of Mount Hooker. From its source, the river flows east and then north, pouring its waters into Athabaska Lake, after a course of nearly 750 miles. Emerging from the western end of Athabaska Lake, it flows northward for fifteen miles and unites with the Peace River to form the Slave River, which in turn passes into the Mackenzie. The drainage basin comprises 58,900 square miles.

Athabaska Lake, into which the river flows, has an area of 2,842 square miles (considerably more than twice the size of Rhode Island), of which 1,041 square miles are in Alberta and the remainder in Saskatchewan. It is the fourth largest lake lying wholly in the Dominion. Its average width, from north to south, is from twenty to thirty miles, and its length, from east to west, is about 200 miles. Its name (see above) accurately describes most of the country surrounding the lake, especially the southern shores, which are low and sandy. The level of the lake is about 700 feet above that of the sea. The lake is a noted breeding ground for the Canada goose.

Athabaska, a former district of Canada, organized in 1882 as a part of the Northwest Territories (which

Athabaska, MOUNT, one of the lofty snow-topped peaks in the Canadian Rockies. It towers to a height of 11,700 feet above sea level, and is situated in the west-central part of Alberta, near the British Columbia boundary, only a few miles east of Athabaska Pass, in which the river of the same name rises.

ATHAPASCAN INDIANS. See INDIANS, AMERICAN (Families or Confederacies).

ATHEISM, *a' the iz'm*, the belief of those who declare that there is no God. The atheist and agnostic are sometimes confused, but they are not the same, for the latter merely claims that one cannot prove that God exists, or that He does not exist (see AGNOSTIC). Belief in a Supreme Being is so natural to mankind that even those who deny that God exists very often set up some sort of an ideal of their own to take the place of the God they refuse to admit. The term *atheist* has been applied very loosely from earliest times, for in matters of religion the tendency in all ages has been to call a man an atheist who departs from a generally accepted creed. The ancient Greeks imprisoned Socrates for "not believing in the gods the city believes in," and the Romans of Nero's time sent the Christians to their death to the cry of "Away with the atheists!"

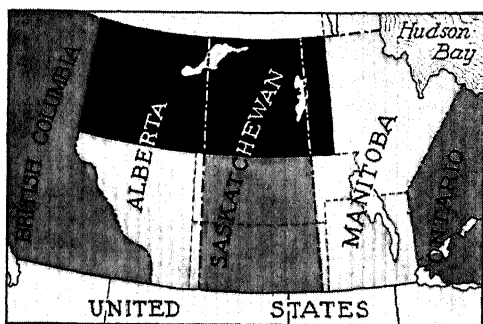
[In these volumes, see the articles on NERO; SOCRATES.]

ATHELSTAN, *ath' el stan* (895-940), the first ruler to bear the title of king of England, was the grandson of Alfred the Great. He succeeded his father, Edward the Elder, in 925, put down a revolt of the Welsh, Scotch, and English, and after a victory at Brunanburh, which has been celebrated in Saxon song, ruled with wisdom and justice. See ANGLO-SAXONS.

ATHENAEUM, *ath e ne' um*, any one of the ancient Greek temples dedicated to the goddess Athene, but especially that temple in Athens where poets and other literary men met to read their productions. At Rome, a celebrated school on the Capitoline Hill having this name was founded by the Emperor Hadrian, about 135 A.D. In the building, which had the form of a theater, literary productions were read, lectures delivered, and recitations conducted. As teachers who were paid salaries were attached to the Athenaeum, it was in a measure a university, and as such was in existence until the fifth century. Schools of a similar character and bearing the name were founded in various cities of the provinces.

Schools ranking next to the universities in Holland and Belgium are known by this name, and it is also applied to scientific clubs and literary societies, to the buildings in which these clubs meet, and sometimes to literary magazines. Among the latter is an important periodical which was founded in London in 1828.

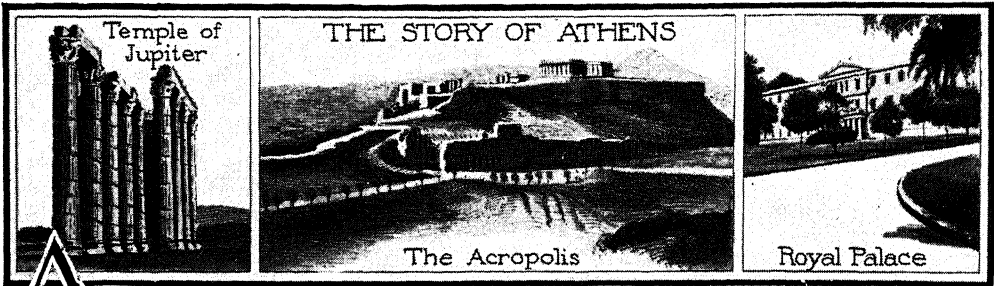
ATHENE *a the' ne*, the Greek equivalent of Minerva (which see). The word is sometimes written ATHENA.



ATHABASKA

Part of Western Canada, showing the former district of Athabaska, in solid black. The light, broken lines show the boundaries of other districts of Northwest Territories before 1905; the heavier lines are present provincial boundaries.

see). It was enlarged in 1895, and then contained 251,300 square miles. In 1905 the district of Athabaska was divided: the western part became the northern half of Alberta; the central part, the northern half of Saskatchewan; a small strip on the east was given to the district of Keewatin. This last part in 1912 was added to the province of Manitoba.



ATHENS, *ath' enz*, one of the most famous cities the world has ever known. Today it is the capital of the republic of Greece, but its great fame dates from the time when it was the capital of ancient Attica. It lies on a plain between the mountains and the sea, about five miles from the harbor of Piraeus, its ancient seaport, and its elevation of 350 feet above sea level assures to it a temperate, sunny climate. Nowhere are the skies bluer and more beautiful than over Athens.

Its Story. The Athenians boasted that their ancestors had not migrated from some other section of the world—that they had sprung from the beloved Athenian soil. Their first king, according to these traditions, was Cecrops, but the most famous was Theseus, celebrated for his victorious conflict with the dreadful Minotaur. This king united under his sway the twelve independent little states of Attica, and made Athens really a capital. In time there came a king, Codrus, whom it was felt there was no one worthy to succeed, and the state was accordingly organized as an oligarchy, or government of the nobility, with a chief magistrate known as the *archon*. In time, the number of archons was increased to nine.

Like the early Romans, these early Greeks eventually found their aristocratic form of government very unsatisfactory, for the rulers were bound by no written laws, and could thus practice any oppressions they chose. The lower classes, therefore, finally revolted and demanded written laws, but when these were drawn up about 621 B.C. by Draco, they were found to be so severe that they bettered matters not at all. Solon, one of the wisest of men, was then chosen, about 594 B.C., to make a new code, and this gave relief by introducing many democratic features.

There were still disturbances, however, and in 561 B.C. Pisistratus secured the aid of a large dissatisfied class and made himself tyrant, or absolute ruler. The city prospered under his rule, however, and under that of his sons Hippias and Hipparchus, and was adorned with many beautiful new buildings. But the Athenians could never submit long to even such benevolent tyranny, and in 509 B.C. a new constitution, proposed by Clisthenes, made of

the state a democracy. This document, while it introduced little that was actually new into the government, provided for the new conditions which had grown up since the time of Solon. Athens was divided into 100 divisions, called *demes*, and each citizen was enrolled in one of these divisions. Ten of the demes, not adjacent but as widely scattered as possible, composed a *ward*, and thus the political unity of the old clans which had caused so much trouble was destroyed. Many of the foreigners throughout Attica were also enrolled as citizens.

In 499 B.C., Athens generously sent to the Ionian colonies in Asia Minor help in their struggle against Persia, and the result was the Persian Wars, which freed Greece for all time from the danger of invasion by that ambitious power. At the close of the conflict, Athens was the leader of Greece, and proceeded to strengthen its position by organizing the Confederacy of Delos. The original purpose of this was the protection of Greek colonies from Asiatic rule, but it speedily developed into a real Athenian Empire. The fifty years following were the most brilliant in Athenian history; under Pericles, especially, Athens was the literary and artistic center of Greece.

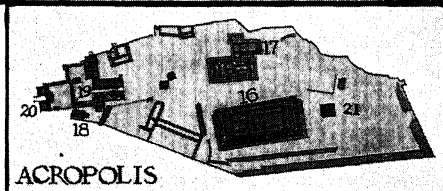
But Sparta, in Southwestern Greece, had watched jealously the rise of its rival to power, and in 431 B.C. it demanded that Athens break up the Delian Confederacy and free all the Greek cities. Athens, in reply, insisted that Sparta relinquish its conquests in the Peloponnesus, the southern peninsula of Greece, and the result was the Peloponnesian War, at the close of which Athens found itself defeated and under the domination of Sparta. A government by Thirty Tyrants was established, but before long the democracy was again restored.

Though Athens never regained its former political position, it remained the intellectual center of Greece. Under Macedonian and later under Roman rule, people still flocked to it as a center of culture, and a number of the Roman emperors favored the city to the extent of erecting new and gorgeous buildings. It played a distinct part in Roman history, for thither for centuries were sent the sons of wealthy



PLAN OF THE ANCIENT CITY

- | | |
|-------------------------|-----------------------------|
| (1) Acropolis | (12) Lyceum |
| (2) Theater of Dionysus | (13) Arch of Hadrian |
| (3) Temple of Dionysus | (14) Aqueduct of Hadrian |
| (4) Olympieum | (15) Agora, or market place |
| (5) Tower of the Winds | (16) Parthenon |
| (6) Hill of the Nymphs | (17) Erechtheum |
| (7) Areopagus | (18) Temple of Victory |
| (8) Theseum | (19) Propylaea |
| (9) Stadium | (20) Pedestal of Agrippa |
| (10) Long Walls | (21) Temple of Rome |
| (11) Sacred Gate | |



ACROPOLIS

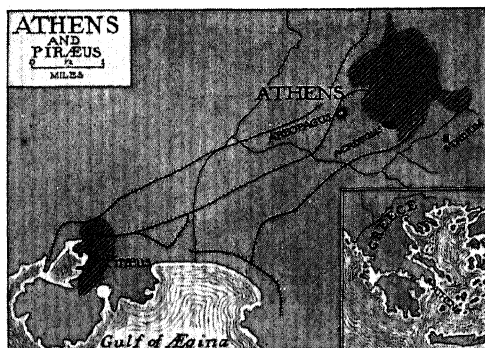
Roman families to finish their education. But from the time of Justinian (A.D. 529), who closed the schools of philosophy, until the eleventh century, the history of Athens was not at all important.

During the twelfth, thirteenth, and fourteenth centuries it was sometimes independent, sometimes subject to an Italian city or to Turkey, but always growing poorer and more wretched. In the fifteenth century, the rule of Turkey was firmly established, but nothing was done to build up the city until it became, after the Greek revolution in 1835, the capital of the new kingdom of Greece. Since then it has had the life and history of an enlightened European capital. One of the most interesting happenings connected with it in recent years has been the establishment of the new Olympic Games and the restoration in marble in 1902 of the great Stadium. The excavations carried on in the city and its vicinity during the past decades have resulted in the recovery of many monuments of the past.

The Ancient City. When ancient Athens is spoken of, it is Athens in the time of Pericles which is meant, rather than Athens throughout its long growth or its later period of decay. In the Age of Pericles, then, Athens was a strong walled city, built about the Acropolis, a rocky elevation about 300 feet above the

level of the city, having on its summit a comparatively level area of somewhat less than ten acres.

Originally, the Acropolis was the fortress to which the inhabitants retreated in time of danger. It could be reached only on the west, where a stairway of sixty marble steps led to a series of colonnades and porticoes called the



LOCATION OF ATHENS

The port of Piraeus was occupied by the British and French allied forces in September, 1916, in the World War.

Propylaea, or Gateway, a magnificent structure built of white marble and trimmed with black marble. Just within the entrance was the great

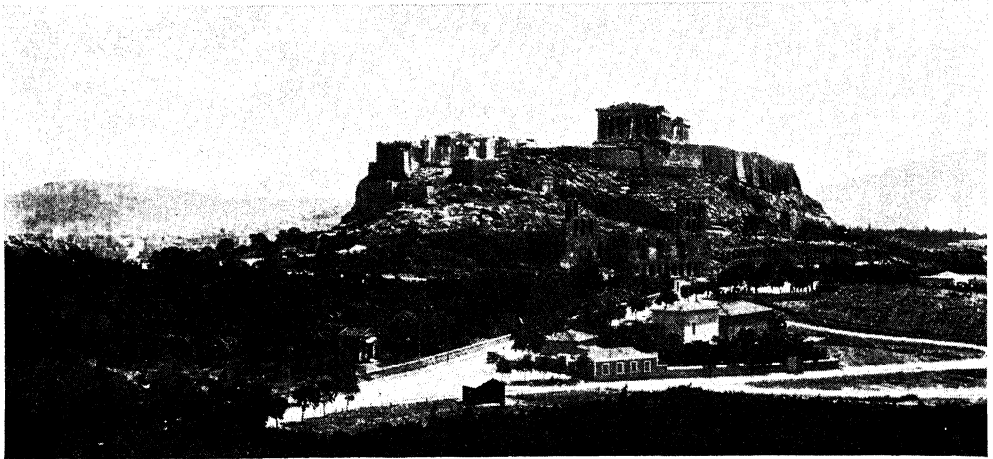


Photo: O R O G

SURVIVING FROM ANCIENT DAYS

A present-day view of the Acropolis, with the Parthenon on its summit. In the refinement of its lines and as the most perfect example of ancient Greek architecture, the celebrated Parthenon, Doric temple of Athene, has never been surpassed.

statue of Athene, the patron and defender of the city, and on the right, a little to the rear, was the Temple of the Wingless Victory. To the right of the center rose the crowning glory of Athens, the Parthenon, an exquisitely beautiful temple dedicated in 438 B.C., and to the left stood the Erechtheum, a beautiful temple of which there still remains the famous Porch of the Maidens.

The city surrounded the Acropolis on every side, extending to a distance of about a mile therefrom. To the north and directly in front of the Acropolis was the Tower of the Winds, an octagonal marble structure erected in 159 B.C. and still fairly well preserved; to the west were the Hill of the Nymphs and the Areopagus (Mars Hill), the rocky eminence from which Paul is supposed to have preached to the Athenians; and to the northwest lay the Theseum, which remains the best preserved of all the ancient Greek temples. On the southwest slope of the Acropolis was the ancient Theater of Dionysus, and beyond it the stately Olympium, begun about 535 B.C., but not finished until 700 years later.

Under the Romans, Athens was a flourishing city which in the second century Hadrian ornamented with many new buildings; but after that time much of the beauty of the city was destroyed, and the pagan temples became for the most part Christian churches and, later, mosques. During the siege of Athens by the Venetians in 1687, the Parthenon was used by the Turks as a powder magazine, and was greatly damaged by an explosion.

The Modern City. Clustered about the foot of the Acropolis lies the so-called Old City, a remnant left from the dreary days before the revival of Athens in 1835; and in a great cres-

cent about it spreads the new city, with its broad boulevards radiating from the central Square of Harmony, and its handsome public buildings. Of these structures, the most magnificent is the royal palace, built of Pentelic marble, which stands in a beautiful, well-kept park somewhat apart from the city. The National Archaeological Museum, which houses an unsurpassed collection of antiquities; the House of Parliament; the National Library; and the National University also have noteworthy buildings, while the Stadium, restored through the generosity of an Alexandrian Greek, has attracted the interest of all the athletic world.

Though Athens has excellent schools and two universities, the National University and the Capodistria University, with nearly 10,000 students, ancient Athens so far outweighs the modern city in public interest that it is for its archaeological schools that the city is most generally noted. These include the American School of Classical Studies, maintained and supported by the universities of the United States, and held in very high repute by Athenians; the French and British schools, and the German Archaeological Institute, all of which combine instruction with investigation, and have made discoveries and restorations of great importance.

Though the financial center of Greece, Athens has few manufactures and engages only in domestic trade. Rugs, silks, scarfs, brass and copper ware—such articles as the tourist likes to take home with him from his visit—are its most important manufactures. The water supply was totally inadequate until 1926, when it was more than doubled by new aqueducts built by American engineering

Outline and Questions on Athens

I. Ancient Athens

- (1) Its beauties
 - (a) Location
 - (b) Acropolis
 - (c) Parthenon
 - (d) Erechtheum
 - (e) Theseum
 - (f) Other buildings
- (2) History
 - (a) Legendary period
 - (b) Government by archons
 - (c) Legislation of Draco
 - (d) Legislation of Solon
 - (e) The tyrants
 - (f) Democracy established
 - (g) Persian wars
 - (h) Age of Pericles
 - (i) Peloponnesian War
 - (j) Roman rule

II. Modern Athens

- (1) Appearance
 - (a) The old city
 - (b) Streets and buildings
 - (c) Institutions
 - (d) Industrial life
 - (e) Population
- (2) History
 - (a) Under Turkish rule
 - (b) Capital of new kingdom
 - (c) Olympic games
 - (d) Archaeological investigations

Questions

In what way did Athens retain its supremacy for centuries after it lost its independence?

What state, through jealousy, brought about the downfall of ancient Athens?

In what way is it evident in the Athens of to-day that the ancient city is of more importance than the modern?

When was the period of greatest glory?

What geographic relation does the modern city bear to what remains of the old city?

When was the most beautiful building in the world used as a powder magazine?

What was the difference between the laws of Draco and those of Solon?

What spot in ancient Athens was connected with a dramatic event in Bible history?

What was the original purpose of the Acropolis?

By what woman was Pericles influenced?

What other name has the Porch of the Maidens?

Is Athens yet the capital of a kingdom?

In your opinion were the Persian Wars justified, as to the Athenians?

companies. Its population, which at its early period of greatness is supposed to have been about 200,000, but which shrank, quite gradually, during the Middle Ages to a few thousands, has increased to 385,000.

[Further information on the relations of Athens to Greece is given in the article GREECE (History).]

Related Subjects. The reader is referred in these volumes to the following articles, where there are many illustrations:

Acropolis	Parthenon
Archon	Peloponnesian Wars
Areopagus	Pericles
Caryatides	Piræus
Cecrops	Pisistratus
Codrus	Solon
Draco	Sparta
Erechtheum	Stadium
Greece	Theseum
Oligarchy	Theseus
Olympian Games	Thirty Tyrants

ATHENS, GA. See GEORGIA (back of map).

ATHENS, OHIO. See OHIO (back of map).

ATHENS COLLEGE. See ALABAMA (Education).

ATHENS OF AMERICA, THE, or THE MODERN ATHENS, names applied to Boston, Mass., at the time when the city was the foremost literary center of America. The names of Longfellow, Holmes, Lowell, and other noted writers are forever associated with the city.

ATHERTON, GERTRUDE FRANKLIN (1857-), an American novelist, a great-grand-niece of Benjamin Franklin, and one of the most alert, independent, and forceful of the modern group of American writers. She was born in San Francisco and educated in California and Kentucky. As Gertrude Franklin Horn, she married George H. Bowen Atherton in 1882, and after his death in 1887 she devoted herself seriously to writing fiction. Between 1892 and 1928, she had about thirty novels published. Mrs. Atherton maintains a broad outlook on life, and views all of its phases with the clear, far-seeing eye of the realist. Her independence makes her scornful of accepted literary rules, and she has her own methods of style, construction of plot, and manner of telling a story. For these reasons critics have called her an "intellectual anarchist."



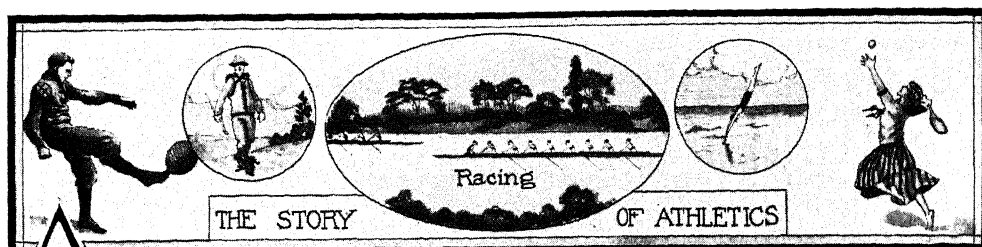
Photo: Brown Bros.

GERTRUDE ATHERTON

Representative Fiction. Mrs. Atherton's novels show a surprising range of background and material. Sometimes the scenes are laid in her native state, as in *The Californians* and *Ancestors*; *Aristocrats* is a story of the Adirondacks; *Senator North* gives a bril-

liant picture of the social and political life of the nation's capital; *Patience Sparhawk*, written in a vein of satire, presents life in New York and Westchester County. *The Conqueror*, one of her greatest books, is based on the life and character of Alexander Hamilton. Her other novels include *Rulers of Kings*,

Tower of Ivory, *Julia France and Her Times*, *The White Morning*, *The Avalanche*, *Sisters in Law*, *Sleeping Fires*, *Black Oxen*, a sensational story based on rejuvenation, published when the subject was everywhere discussed, *The Crystal Cup*, *The Immortal Marriage*, and *Jealous Gods*.



ATHLETICS, *ath let' iks*. Originally this term was applied to any kind of outdoor sports. More recently, however, its use has been restricted largely to trials of physical skill, strength, or endurance among a number of contestants. The chief athletic sports which are included in the term are football, baseball, basket ball, rowing, swimming, hockey, polo, and lawn tennis, as well as field and track games and gymnastics. Track games include running for various distances, from twenty-five yards to two miles or more, and leaping over hurdles. Among the more familiar field games are pole vaulting, high and broad jumping, putting the shot, and throwing the hammer, javelin, or the discus. The swinging of dumb-bells and Indian clubs, weight-lifting, and practice on the horizontal bar are grouped under gymnastics.

Professional Athletics. According to the way in which they are organized, athletic contests may be divided into two groups—professional and amateur. The chief professional sport of the United States and Canada is baseball; its popularity fills foreigners with never-ending wonder. The United States has two major leagues, and both it and Canada have a number of smaller ones. Enormous sums are spent annually in hiring players, erecting stands, and maintaining grounds; such expense can be supported only by heavy gate receipts, and baseball has become a business, conducted like any other, for gain, although possessing great elements of sporting rivalry. Within the past few years, interest in football as a professional sport has greatly increased.

Amateur Athletics. Amateur athletic contests, on the other hand, are conducted without thought of gain. They are enjoyed as a spectacle, and practiced, in theory at least, for the physical benefit of the players. It is the mark of the amateur that he does not play for money, and great care is exercised to exclude athletes who have accepted money for their athletic prowess. Certain ideals of fair play are cher-

ished by the amateur, who makes it a point of honor to be a "good loser." Amateur athletic events are arranged among groups of athletic societies, cities, schools, and churches. National amateur organizations standardize rules and promote regularity. They have played a considerable part in arranging international contests.

Canadians share the British fondness for cricket, and they excel in playing their national game, lacrosse. This is played both as a professional and an amateur game. Hockey, too, is an exceedingly popular game, and it is growing in favor.

In the United States, college athletics occupy a very prominent place in student life. The chief game, from point of view of popular interest, is football, which has been until recently almost wholly an amateur sport. Enormous crowds, even larger than those that witness many championship games of baseball, crowd the stadiums, to witness the triumph or defeat of a team of eleven brawny young men in dusty uniforms. The excitement is intense, the enthusiasm boundless. The desire to produce a winning team has resulted, doubtless, in a high degree of specialization, so that the benefits of athletics tend to be confined to small groups rather than the student body as a whole. This has resulted of late in no little criticism, and efforts are being made to free college athletics from too great specialization, as well as cleanse them of the taint of professionalism.

Training. To gain the skill and endurance that will enable him to withstand the prolonged strain of contests on field or track, the athlete has to subject himself to careful training. Athletic organizations commonly hire trainers and coaches, as well as physical directors, to help the athletes to get into condition and to give them special training for the games in which they will compete. Trainer and coach show the novice how to use his effort in the most economical and telling way, and perfect him in what is called "form."

During the training season, proper food and plenty of sleep are of the first importance. Members of athletic teams in the colleges eat, usually, at a common table, the dishes of which are carefully selected and supervised. Simple, wholesome food is the rule; rich and exciting sweets are banished. Tobacco and most stimulants are forbidden, since their harmful effects are well established. The athlete goes to bed, not precisely like the little boy in Stevenson's poem, "by day," but early enough to get eight or nine hours of sleep each night. His muscles are regularly rubbed and kneaded by a trainer, to take out the stiffness and render them supple. A "rub-down" with alcohol supplements regular and frequent bathing. A bath after violent exercise on a dusty or muddy field is, of course, indispensable, and the shower bath is preferred by most physical directors.

Athletics an Aid to Health. There is no surer road to the goal of perfect health than regular exercise in the open air, and every boy and girl should have a thorough knowledge of at least one sport or recreation, such as baseball, hockey, tennis, golf, swimming, or horse-back riding. For stirring up the blood, developing the muscles, clearing the head, and stimulating the appetite—in fact, for building up a strong, healthy body—nothing is better than athletic games. Moreover, engaging with others in wholesome sports helps one to overcome many undesirable traits of character—laziness, timidity, conceit, lack of consideration, etc. It should always be kept in mind, however, that overindulgence in sports is as harmful as intemperance in eating and drinking. The player should temper his enthusiasm according to the limits of his bodily endurance, and never subject any part of the physical machine to undue strain. One of the common errors to avoid is sitting in a breeze "to cool off" while the body and clothing are wet with perspiration. E.D.F.

Athletics in the High School

There is growing discontent with the facilities for recreation and athletics, in the high school, especially. Many high schools are reporting that they are accomplishing a good deal in the physical education of their pupils, and they point to their athletic teams in confirmation of their statements. At the beginning of the school year, all pupils are urged to try for the various teams. The best-developed and the physically strongest boys and girls "make" the teams. What happens to those who are not well developed—who are not strong, and who need athletic training? They are mostly crowded to the side lines as spectators. This system selects those already well trained and least in need of further training, and devotes practically all the resources of an

institution to the further training of these few individuals.

In some high schools, the majority of the pupils are not permitted to use the gymnasiums after school hours, because they are needed by the teams. In such schools, the boy or girl who most needs exercise has only one or two brief periods of training each week. In many schools, the physical-training teachers devote nine-tenths of their energies to pupils on the teams, who are least in need of their service.

If this is good educational policy, the rest of our educational system must be hopelessly awry. In teaching mathematics, history, science, or any other subject, we do not select a few pupils because of their superior ability and give them special attention, while others are left to shift for themselves.

Teams Should Be Subordinate. There is no implication in what has been said that there should not be teams in a high school; but if they cannot be trained without sacrificing the rest of the pupils, they ought to be abandoned. It would be better to give less attention to the teams and more to the mass—better for everyone concerned. As it is, members of teams are often overtrained so that they are injured, while the great majority of pupils are undertrained.

There is evidence to show that young persons are sometimes injured by athletic contests. Medical examiners in certain schools have made extensive examinations of high-school pupils who are members of athletic teams, and they have found boys who play basket ball on teams who show overstrain of the heart. Physicians who are familiar with the facts are beginning to warn parents against permitting their children to engage in severe physical contests. Teachers are becoming aroused to the fact that undue effort in athletics may result in overstrain to the growing boy or girl.

"Making" a Team the Only Road to Distinction. It is important for another reason to reduce the prominence of teams and inter-scholastic competition in high schools. In some schools, the only road to distinction lies through athletic contests. Pupils in such schools have said: "I want to make the team. One can't have any standing in this school unless one can get on a team. If I can't get on a team, I am going to drop out of school."

In these times, we need to hold up for public admiration pupils who excel in intellectual activities. Their names should be put in the papers. They should be cheered by their fellows. So long as athletic heroes secure all the admiration, so long will athletics be the chief attraction for most boys in high school. They will put forth their best efforts in that, and not in intellectual directions. We need to exalt superiority in debating, in work on

Outline and Questions on Athletics

I. History

- (1) The Olympian Games
- (2) Athletic games of the Romans
- (3) Knightly jousts and tournaments
- (4) Revival of the Olympian Games

II. Modern Athletics

- (1) Professional
 - (a) Baseball in the United States
 - (b) Lacrosse in Canada
 - (c) Cricket in England
- (2) Amateur
 - (a) As a source of amusement
 - (b) As a physical benefit
 - (c) Standard rules
 - (d) International contests
 - (e) College athletics
- (3) Training
 - (a) Under directors and coaches
 - (b) Regulation of sleep and diet
 - (c) Care of the body

III. Benefit of Athletics

- (1) An aid to health
- (2) An aid in character-development
- (3) Harm in over-indulgence

IV. Athletics in the High School

- (1) Discontent with facilities
- (2) Exalting the athlete
- (3) Lack of training for those who need it
- (4) Wrong use of gymnasium
- (5) Why girls need athletic exercises

Questions

What is the harm from over-indulgence in athletic sports?

Distinguish between athletic games, gymnastics, track games, and field games.

Which nation has kept up the athletic traditions most consistently through the centuries?

Describe the rigorous training which members of college teams have to undergo.

What is the Yale "Bowl"?

Is a player who sulks or protests when he loses considered a fair type of athlete?

How do we know that no country has ever surpassed Greece in the perfection of its physical manhood?

What did the Olympian Games mean in ancient times? What do they mean to-day?

What is regarded as the national game of Canada? Of the United States? Of England?

What advantage could come to a selfish boy from playing baseball?

What danger to college athletics arises from the keen desire to win championships?

the school paper, in sketching and designing illustrations and decorations for the school and the home. After all, mere brawn is of minor importance in modern life, though tradition tends to keep it in first place in schools.

Athletics for Girls. Probably one-third of the girls who graduate from high school have curvature of the spine, or uneven shoulders, or stand in a bad position, or have too much flesh, or too little. What is the cause of these defects? The prevailing theory is that high-heeled shoes, constriction in dress, and lack of systematic exercise are responsible; but one reason why girls are so poorly formed is because relatively little attention has been given to their physical development. In some schools, girls do not have any regular physical exercise. They are not advised by capable teachers regarding their defects and how to overcome them. But conditions are probably better to-day than they have been heretofore. A girl's dress to-day is better adapted to healthful physical development than it was a few years ago. Seats are better adapted to the needs of individual pupils. The value of harmonious physical development is beginning to appeal to the layman as well as to the teacher. But there is one need which has not yet been met in most schools.

Games Furnish the Best Physical Development. Some schools are inaugurating a movement which should be adopted by all the schools of the country, the aim of which is to arrange that each pupil may play at least two games suited to his physical constitution and his temperament. Pupils are examined by a medical advisor, who can determine whether an individual should play basket ball, hockey, baseball, or engage in bowling, swimming, running, or other sports. No pupil is permitted to choose his games blindly and to follow the practice of pupils who may be constituted differently.

A game is better for exercise and physical development than formal gymnastics. Progressive high schools are minimizing mechanical exercises which pupils take because they are compelled to and not because they are enthusiastic about them. It is very doubtful whether any kind of physical exercise taken under compulsion is of great benefit to a boy or a girl. The mental factor is of vital importance. When a pupil is performing an exercise that he dislikes, the organism does not respond properly. But when he does a thing he enjoys, the whole system works in harmony, and every organ is benefited. M.V.O's.

Related Subjects. In the following index are listed the athletic sports which are discussed in these volumes. Many closely related topics are given in the lists under GAMES AND PLAYS AND AMUSEMENTS.

Archery

Aquaplaning

Baseball

(Baseball, Indoor)

Basket Ball	Hockey
Battledore and Shuttlecock	Hurdling
Bowling	Lacrosse
Boxing	Lawn Tennis
Canoe and Canoeing	Olympian Games
Cricket	Pole Vault
Curling	Polo
Discus, Throwing the	Quoits
Dumb-Bells	Race
Fencing	Rowing
Football	Skates and Skating
Golf	Ski
Hammer, Throwing the	Shot, Putting the
Handball	Snow Shoe

Swimming
Tennis

Tobogganing
Wrestling

ATHOR, *ah' thor*, OR **HATHOR**, the Egyptian goddess of music and the dance, of joy and love, corresponding to the Aphrodite of the Greeks. In early times, the Egyptians used a buffalo's skull raised on a pole in connection with her worship, and from this came the sacred Athor column of Egyptian architecture, which has on the top a female head with the ears of a cow. Athor, the third month of the Egyptian year, was named for her.



Photo: U & U

AIRPLANE VIEW OF ATLANTA

ATLANTA, GA., the capital, the largest city of the state, and the county seat of Fulton County, is situated in the northwestern part of the state, about seven miles from the Chattahoochee River. Savannah, the chief Atlantic port south of Baltimore, is 293 miles to the southeast. The Gulf of Mexico is but little more than that distance to the south. Atlanta enjoys a position in its own territory similar to that of Chicago in the Middle West. As the logical distributing and receiving point for the Southeastern states, it has become the commercial metropolis and railway junction point of an extensive territory, earning thereby its popular name, *Gate City of the South*. The city is the headquarters of the Sixth Federal Reserve District. From a business standpoint, Atlanta has more of a metropolitan aspect than most cities of its size. A great depart-

ment store has been established here by R. H. Macy of New York; the Sears-Roebuck Company of Chicago has a \$7,000,000 branch in the city; the Ford Motor Company operates an assembly factory; and wholesale distributing plants have been established by Marshall Field & Company and Carson, Pirie, Scott & Company, both of Chicago. The city is southeastern headquarters of the United States Veterans' Bureau, and near the city is United States Veterans' Hospital No. 48.

Population, 1928, 255,100 (Federal estimate). About one-third of the inhabitants are negroes.

General Description. The city has an attractive and healthful site in the foothills of the Blue Ridge Mountains, 1,050 feet above sea level, on a height of land that separates the watersheds of the Gulf of Mexico and the

Atlantic Ocean. Beautiful suburban towns occupy the hills and valleys about the city, which itself is one of the most delightful residential communities in the South. Peachtree and Ponce de Leon are the finest of the city boulevards; the former connects with the principal motor highway leading to New York City. Atlanta is the headquarters of the Fourth Corps Area, and has on its southern border Fort McPherson, home of the Twenty-second Division of the United States Infantry. The city is also the location of a Federal prison. Stone Mountain (which see), sixteen miles northeast, is the principal natural attraction in the vicinity.

The city is the center of a developing network of air-mail service, with lines extending to Mobile, New Orleans, Washington, New York, Boston, Chicago, and to points in Florida.

Transportation and Industry. Eight railway systems, operating fifteen main lines, serve the city. About 150 passenger trains enter and leave Atlanta every twenty-four hours, and the heavy freight and package service utilizes several hundred cars, daily. The railways are the Atlanta, Birmingham & Atlantic; the Atlanta & West Point; the Central of Georgia; the Georgia; the Louisville & Nashville; the Nashville, Chattanooga & Saint Louis; the Seaboard Air Line; and the Southern. There is direct connection with Chicago, and by way of that terminal, connection with points west.

In addition to its excellent facilities for handling its manufactured products, Atlanta has easy access to a wide variety of raw materials and to fuel and hydroelectric power. Within a radius of little over a hundred miles are forests of usable timber, and quantities of granite, marble, portland-cement materials, iron ore, and clays of nearly every kind. Cotton, fruits, general farm crops, and dairy products are produced in abundance in the adjoining agricultural region. Coal is mined in three neighboring counties, and the rivers in the Blue Ridge Mountains, fed by copious snows and an abundant rainfall, are a cheap and reliable source of power. Most of the wheels in Atlanta's factories are turned by electrical energy. The Federal census has listed over 1,500 different commodities produced in the Atlanta manufacturing district. The city is an important distributing center for raw cotton, tobacco, grain, horses, and mules. The soft-drink industry rivals that of any other city in America. Recently several large textile plants have been erected in the Atlanta zone.

Institutions. Atlanta increased its prestige as an educational center in 1914, when Emory University was moved to the city from Oxford, Georgia; and again in 1916, with the reopening of Oglethorpe University, an institution once located at Midway, but destroyed in the War of Secession. The Georgia School of Technology, Agnes Scott College for Women, various professional schools, and a number of special schools and colleges for negroes complete the circle of thirty-four institutions of higher learning in the city and vicinity.

History. The history of Atlanta parallels that of the railroads which converge at this point. Soon after the passage of an act by

the state of Georgia in 1836 authorizing the construction of a state railroad, the present site of the Union Station was located, and called Terminus. In 1843, the name was changed to Marthasville; in 1847, when the city was incorporated, the name Atlanta was chosen. Meanwhile, in 1845, the state road (now leased by the Nashville, Chattanooga & Saint Louis) had united with the Georgia Railroad, marking the beginning of the industrial prosperity of the city. With the construction of these and other lines, Atlanta became a commercial as well as a natural gateway to the productive South.

The city was an important strategic point in the War of Secession as early as 1861, when it was the depot for Confederate military supplies. This made it an objective point in General Sherman's famous march to the sea. After a siege of several weeks, it was taken in September, 1864, and a few days afterward Sherman ordered all civilians to leave within five days, when the city became an immense military camp. On the evacuation of the troops in the following November, the city was almost totally destroyed by fire. Sherman compared the strategic position of Atlanta to the wrist of a hand, the five fingers pointing to the five principal ports of the Gulf of Mexico and the Southern Atlantic coast.

During the reconstruction era, Atlanta became the capital of the state (1878). The Cotton Exposition in 1881 and the International Exposition in 1895 were important factors in the progress of the city. A zoning plan has been adopted, the school system has been reorganized, and many skyscraper office buildings have been erected. W.A.S.

ATLANTA UNIVERSITY. See GEORGIA (Education).

ATLANTES, at lan' teez. See CARYATIDES.

ATLANTIC CITY, N. J., a year-round seaside resort which has one of the best beaches along the Atlantic coast. The city is situated on an island known as Absecon Beach, which is ten miles long and three-fourths of a mile wide. Absecon lighthouse, 167 feet high, is on the northern end of the beach. The island is separated from the mainland, the south New Jersey coast, by a narrow strait and meadows from four to five miles wide, which are only partly under water at high tide. Philadelphia is sixty miles northwest, and New York City, 143 miles north by east. Population, 1928, 54,700 (Federal estimate).

The Board Walk, sixty feet wide, stretching for eight miles along the beach, is one of the world's famous promenades. It is lined with fine theaters, shops, and magnificent hotels, all with unobstructed view of the ocean. Extending from the walk out to sea are six great ocean piers, devoted to amusements. There are about 1,200 hotels and boarding

houses, and approximately 12,000,000 visitors are entertained annually.

In 1854 the Camden & Atlantic Railroad was completed to the little settlement, which dates from 1780. In that same year it was incorporated under the name Atlantic City. The commission form of government was put into effect in 1912. S.L.D.

ATLANTIC OCEAN, that division of the world-enveloping sea lying between Europe and Africa on the east and North and South America on the west. It is named from Mount Atlas, in the northwestern part of Africa. The western projection of Africa and the eastern projection of South America divide the Atlantic into two oceans, the North Atlantic and the South Atlantic. It is the saltiest of the great oceans.

Size. The Atlantic is a long, narrow ocean with more irregular boundaries than any other great body of water. It has no distinct northern and southern boundaries; therefore various lengths are given it by different geographers. Those who consider the Arctic Circle to form the northern and the Antarctic the southern boundary fix the length as 9,000 miles. More recent authorities, however, divide the Antarctic or Southern Ocean among the Atlantic, Pacific, and Indian oceans; this division gives the Atlantic a length of 13,000 miles. Its greatest breadth, between Florida and the Strait of Gibraltar, is 4,150 miles, and, if the Gulf of Mexico be included, 5,000 miles. Between Greenland and Norway, the breadth is 930 miles, and between Cape Saint Roque, South America, and Sierra Leone, Africa, it is about 1,800 miles. Between New York and Liverpool it is about 3,200 miles.

Including coast waters, the area is about 41,000,000 square miles; its basin alone is 31,530,000 square miles in area. It covers over one-fifth of the earth's surface and includes three-tenths of the water surface of the globe. The Pacific Ocean alone is larger.

The Ocean Bed. The bed of the Atlantic is divided into two valleys by a ridge extending lengthwise, each of which is about 500 miles wide. This ridge is nearly parallel with the coast lines, and is shaped somewhat like the

letter S. The eastern valley varies in depth from 14,000 to 15,000 feet, and the western from 13,000 to 16,800. North of the Azores

Islands, the bottom of the ocean gradually rises and forms a plateau whose length extends from the Hebrides to Newfoundland. This is sometimes known as the Telegraph Plateau, because the Atlantic Cable is laid on it (see illustration, article CABLE, SUBMARINE). Along this plateau and over the ridge separating the valleys, the ocean has a depth of 9,000 to 10,000 feet. The greatest depth, 31,366 feet, is north

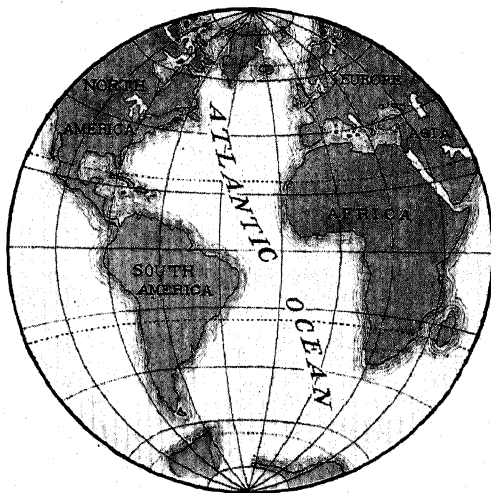
of Porto Rico (Porto Rico Trench); east of Newfoundland a depth of 20,000 feet has been found, and in the South Atlantic there are depths of 20,000 to 24,000 feet. Telegraph cables have been laid six miles below the surface in the Pacific Ocean. The greater part of the bottom of the Atlantic is covered by a deposit of shells of minute organ-



Photo: U & U

A PLAYGROUND OF THE EAST

An aerial view of Atlantic City, in which are seen the celebrated Board Walk and some of the recreation piers.



EXTENT OF ATLANTIC OCEAN

isms which are replaced in greater depths by red clay. Parts of pelagic (oceanic) mollusks are found in shallow tropical waters, and red, blue, and green muds, with volcanic and coral fragments, are abundant along the coast of Brazil.

Outline and Questions on the Atlantic Ocean

I. Location and Size

- (1) Boundaries
- (2) Length, 13,000 miles, including Antarctic Ocean
- (3) Average width, 3,000 miles
- (4) Greatest width, 5,000 miles
- (5) Area, including coast waters, 41,000,000 square miles

II. Shore Line and Coast Waters

- (1) Coasts of northern part irregular
- (2) Length of shore
 - (a) Eastern, 32,000
 - (b) Western, 55,000
- (3) Coast waters
- (4) Islands

III. Ocean Bed

- (1) Two parallel valleys
- (2) Telegraph Plateau
- (3) Varying depths

IV. Temperature and Currents

- (1) Temperature at surface
- (2) Temperature at bottom
- (3) Gulf Stream
- (4) Labrador Current
- (5) South Atlantic currents

V. Life

- (1) Source of food supply
 - (a) Fisheries
- (2) Smaller forms

Questions

If the highest mountain of North America were placed at the deepest point in the Atlantic Ocean, would its top show above the water?

How does the ocean compare with other great bodies of water as regards regularity of outline?

Does the temperature of the ocean vary according to depth as the temperature of air varies according to altitude?

How large a proportion of the land surface of the globe could the Atlantic Ocean contain?

Why is the western coast of Europe warmer than the eastern coast of North America in the same latitude?

From what is the name of this ocean derived?

What is the Telegraph Plateau, and why is it so named?

About how many square miles of water surface are there on the globe?

How does the Labrador Current work damage to navigation?

Shore Lines and Coast Waters. The eastern shore line has a length of 32,000 miles; the western, 55,000 miles. The coasts of Europe and North America are very irregular, but those of Africa and South America contain few indentations. The coast waters on the east are the North Sea, Baltic Sea, Bay of Biscay, and the Mediterranean and Black seas, the latter over 2,500 miles inland. On the west they include Hudson Bay, the Gulf of Saint Lawrence, Gulf of Mexico, and Caribbean Sea. The most important islands in the North Atlantic are the British Isles, the Canaries, Iceland, Greenland, Newfoundland, the West Indies, the Azores, and Cape Verde Islands. The islands of the South Atlantic are unimportant.

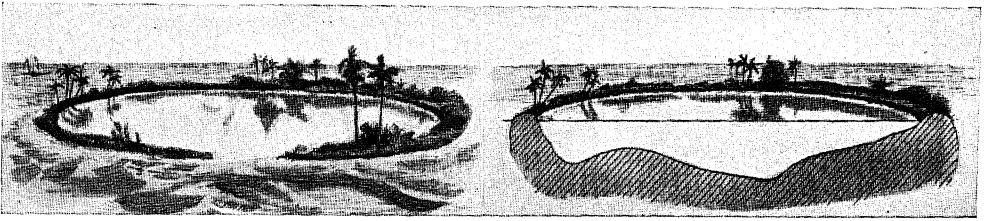
Temperature. The temperature at the surface varies from about 80° F. in the tropical regions to 28° F. on the borders of the Arctic Ocean. In the tropical regions the temperature falls rapidly for the first 1,500 feet of descent. The water on the bottom of the ocean is near the freezing point, and changes but little.

Currents. The North and South Atlantic have each a system of sea currents, or rivers, in the ocean. In the North Atlantic, the most noted of these is the Gulf Stream. It carries the warm water from the tropical regions northward and then eastward, making the western coast of Europe much warmer than the eastern coast of North America in the same latitude. Flowing southward between the Gulf Stream and the coast is the Labrador Current, a cold-water stream which brings many icebergs into the warmer regions. The system in the South Atlantic is similar to that in the North Atlantic.

Life. The Atlantic Ocean is one of the largest sources of food supply in the world. The greater part of the supply of fish furnished to the nations of Europe and America are taken from it, and the most important are the herring and the cod. Extensive fishing grounds are located on and near the Grand Banks, off Newfoundland, and the Dodder Banks, in the North Sea. Tons of oysters and other shellfish are caught in the innumerable branches of the ocean.

The temperature of the surface waters determines the distribution of animal life. Sponges are obtained off the coast of Florida and in the Mediterranean, and the tropical seas are filled with millions of minute creatures, which, while not adding anything to the supply of man's necessities, beautify the sea by the phosphorescent light which they emit. In the greatest depths, giant fish hitherto unknown are being discovered.

Related Subjects. The reader is referred in these volumes to the following articles:



AN ATOLL

The first illustration presents the surface appearance; the second, a cross section showing usual depth and form of walls

Cable, Submarine
Grand Banks
Gulf Stream
Iceberg

Ocean
(Ocean Currents)
Tides
Waves

Related Subjects. The reader is referred in these volumes to the titles in Mythology named above; also, to the articles **PLEIADES**; **ATLAS MOUNTAINS**.

ATLANTIS, an island which, according to ancient tradition, existed in the Atlantic Ocean near the Pillars of Hercules (Strait of Gibraltar). Plato and Pliny wrote of it, declaring that it had been the home of a great nation but had finally been swallowed up by the sea. Some investigators believe that in the very remote ages there may have been such an island, but others regard the whole legend as the outgrowth of some prehistoric discovery of the New World.



THE MYTHICAL ATLAS

Atlas, we read in ancient song,
Was so exceeding tall and strong,
He bore the skies upon his back,
Just as the pedler does his pack;
But, as the pedler over-press'd
Unloads upon a stall to rest,
Or, when he can no longer stand,
Desires a friend to lend a hand,
So Atlas, lest the ponderous spheres
Should sink, and fall about his ears,
Got Hercules to bear the pile,
That he might sit and rest awhile. SWIFT—*Atlas*.

ATLAS, in the mythology of the ancient Greeks, a Titan whom Zeus condemned to bear the heavens on his shoulders. Through the centuries he stood, almost fainting with weariness, until Perseus came by, bearing the head of the Gorgon, Medusa, which turned all who looked upon it into stone. At Atlas' request, Perseus held up the head, and the giant was changed into the mountains which bear his name. When the earliest collection of maps appeared, it bore on its title page the picture of Atlas bending under the weight of the earth, and such books have therefore been called atlases to this day.

ATLAS MOUNTAINS, the name given to the chains of mountains running parallel to the north coast of Africa, from Cape Nun on the Atlantic Ocean, across Morocco, Algiers, and Tunis to the Gulf of Gabes, on the Mediterranean, a distance of 1,500 miles. These ranges are named after Atlas (which see), who, according to ancient mythology, supported on his shoulder the vault of the heavens.

The mountains are roughly divided into two main parallel chains, running southwest to northeast. The Inner, or Greater Atlas, lying toward the Sahara, is separated by high plateaus from the lower mountains of the Lesser, or Maritime Atlas, along the Mediterranean coast. Morocco contains the highest peaks of the system, Jebel Ayashi being 14,600, and Tamjurt, 14,500 feet above sea level. The mountains contain many minerals, including silver, antimony, lead, copper, and iron. Beautiful marble is found in many parts of the ranges. The vegetation of the northern and higher regions resembles that of Europe, but the southern slopes, exposed to the hot, dry winds of the Sahara, are generally bare and sandy. Even the higher peaks are snow-covered only in winter. See **AFRICA** (Surface).

ATMOSPHERE, *at' mahs feer*. For an account of the work done by the atmosphere in the formation of soil, see **SOIL**; see, also, **AIR**; **EARTH** (Parts of the Earth).

ATMOSPHERE. Atmospheric pressure of fifteen pounds to the square inch is called *one atmosphere*. See **BOILING POINT**.

ATMOSPHERIC DUST. See **DUST**, **ATMOSPHERIC**.

ATOLL, *a tol' or at' ol*, a picturesque coral island common in the Pacific Ocean, consisting of a circular strip, or ring, of coral enclosing a shallow pool or lagoon. The reef usually has a thin covering of soil, in which grow palm and breadfruit trees. In many cases, the edges of a submerged volcanic crater supply the base of the structure. The circle of the atoll is usually broken on the side of the prevailing winds, so the lagoon has an opening into the surrounding sea. See **CORAL**. R.H.W.

ATOM, the smallest particle of an elementary substance that can exist as that substance. An elementary substance is one that is made up of "smallest particles" all of the same kind. If we were to divide one of these particles, we should destroy its identity. Scientists believe that there are but ninety-two substances having atoms all of the same kind; of these, ninety have been discovered (see table in the article **CHEMISTRY**). All matter, therefore, is resolvable into ninety-two different kinds of atoms.

Modern chemistry is based on certain suppositions about atoms that were stated by John Dalton in the atomic theory (see following article). The name *atom*, from two Greek words meaning *not divided*, was applied by him in the belief that atoms are the indivisible, ultimate units of matter in any form. This hypothesis was accepted without question until the discoveries of the electrical basis of matter and radioactivity forced scientists to adopt a different conception of atomic structure.

Though inconceivably small, atoms now are known to be made up of still smaller particles called *protons* and *electrons*. These are positive and negative units of electricity, and they are, so far as known, the ultimate particles of matter. They do not vary from atom to atom, but their varying number and arrangement give us the ninety-two elements of which matter is composed. It is true that men by ordinary chemical processes cannot break up atoms, but nature does this in the disintegration of radioactive substances; therefore, it is incorrect to say that atoms are indivisible under all conditions. Whenever an atom is broken up, however, it ceases to be that particular atom, and so our definition stated in the opening lines of this article holds good. By specially devised laboratory methods, scientists are learning how to break up atoms artificially, but matter so attacked is decomposed in such minute quantities that these experiments are not as yet of practical importance. See **CHEMISTRY** (Transmutation of Elements).

Atoms unite to form molecules. A molecule of an element may consist of one, two, or more atoms of the same kind. The hydrogen molecule consists of two hydrogen atoms in chemical combination. When two atoms of hydrogen unite with one atom of oxygen, a molecule of water is formed. Water is an example of a compound substance. The molecules of compounds consist of chemically combined atoms of different elements.

It is impossible to visualize the size of atoms, but the following statement by Dr. W. R. Whitney (General Electric Company) will help one to appreciate the number in a small quantity of matter:

There are so many atoms of hydrogen in one drop of water that if atoms were as big as the drop, it would cover the whole world with one foot of water. T.B.J.

Related Subjects. In the article **CHEMISTRY**, the reader will find a detailed account of the modern theory of atomic structure, and a statement of its correlation with chemical activity, properties of the elements, and kindred subjects. In addition, the following articles in these volumes should be read:

Affinity	Molecule
Atomic Weights	Radioactivity
Electricity	Radium
Matter	Roentgen Rays

ATOMIC THEORY, a theory formulated by the English chemist, John Dalton (1766-1844), to explain the laws of chemical action. This theory was a revival of the hypothesis held by the ancients long before the Christian Era, that all matter finally is resolvable into indivisible particles, which Dalton called *atoms*. The atomic theory as stated by Dalton is as follows:

1. All elements and compounds are made up of indivisible particles, or atoms.
2. The atoms of the same elements have the same weight.
3. The atoms of different elements have different weights.
4. Chemical action is due to the union or separation of the atoms of the elements.

The theory was devised to explain certain facts in connection with chemical reaction. It was known from repeated experiments that the elements forming any substance are always present in the same proportion by weight. Again, when one element, such as nitrogen, unites with another element, oxygen, in several proportions by weight, yielding different compounds, the different proportions of oxygen united with one part of nitrogen are simple multiples of a common factor. All the proportions in which the elements combine with one another can be expressed in terms of a set of numbers, one for each element, and the multiples of those numbers. These numbers are the atomic weights of the elements (see **ATOMIC WEIGHTS**).

While Dalton's theory accounted for these phenomena, the theory itself has had to be modified in some particulars. Atoms are known now to consist of still smaller electrically charged particles, and to be divisible under some conditions. Even the statements regarding atomic weights have had to be revised, for the study of radioactive elements has brought to light the existence of *isotopes*, elements of the same chemical properties but of different atomic weights. T.B.J.

Related Subjects. The reader will find a detailed statement of these modifications in the article **CHEMISTRY**. See, also, **ATOM**, and appended list of articles.

ATOMIC WEIGHTS. As commonly used, this term refers to the *relative* weights of the

different kinds of atoms of which all matter is composed; in other words, the weight of any atom as given in a table of elements indicates how many times heavier or lighter that atom is than some other atom taken as a standard. To attempt to ascertain actual atomic weight, in a fraction of a gram, would involve laborious calculations and cumbersome fractions. For example, investigation has shown that 16 grams of oxygen contain about 606 times 10^{21} atoms, and the weight of a single atom of oxygen is a fraction of a gram expressed as follows: *zero, decimal point, 21 ciphers, 026.4*. By comparison, the actual weights of all other atoms could be determined in equally cumbersome figures.

The common system of determining atomic weight is much more convenient and practicable. It is based on the known law that the atoms of elements always unite in definite proportions by weight to form compounds.

[See the preceding article, ATOMIC THEORY, for a fuller statement of this law. For detailed description of the processes used in determining the relative weights, see any comprehensive text on chemistry.]

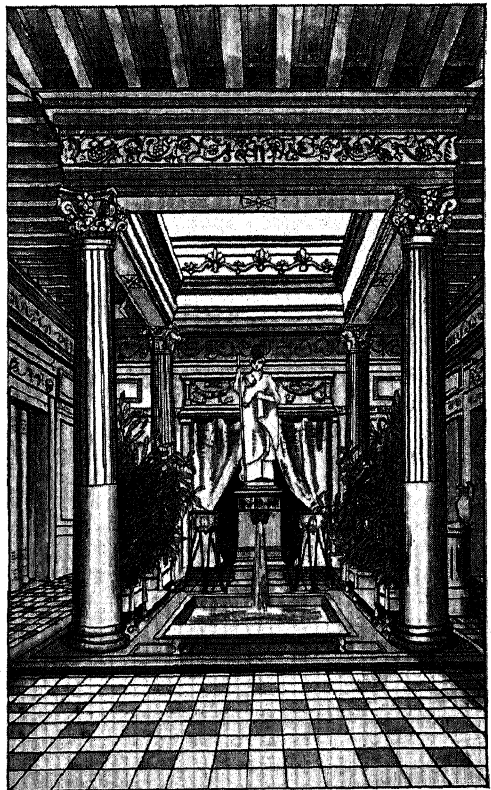
Various standards have been used in calculating atomic weight. Dalton, who formulated the atomic theory, selected the lightest atom, hydrogen, as the basis of reference. By experimentation, it was found that the oxygen atom is 15.88 times as heavy as the hydrogen atom. Since most of the values of the atoms are determined experimentally by reference to oxygen, which is one of the most active of the elements, the hydrogen standard was abandoned in 1905 by general consent, and atomic weights now are based on the sixteenth part of the oxygen atom, which was given atomic weight 16. On this basis, hydrogen has weight 1.008. The relative values remain the same, regardless of the system used, for in either case hydrogen is not quite one-sixteenth as heavy as oxygen. In the table of elements given under CHEMISTRY, in these volumes, the atomic weights are on this basis, and the number of times any element is heavier or lighter than oxygen can be determined by dividing its atomic weight by 16.

It was formerly supposed that all the atoms of an element had the same weight. It is now known that some elements are mixtures of like elementary substances with different atomic weights. These substances are called *isotopes*. More on this subject will be found in the article CHEMISTRY, subtitle *The Elements*. In the light of the newer knowledge concerning the structure of atoms, an atomic weight is known to reveal the number of positive electrical units in the nucleus of an atom. This subject is also discussed at length in the article CHEMISTRY. T.B.J.

ATONEMENT, a *tohn' ment*, the act of making *as one*, or reconciling those who have been separated because of acts of offense or strong differences of opinion. Atonement means reconciliation. This act may consist of an offering, such as a present, or an apology, or a plea for forgiveness.

While this word is sometimes used in connection with the relations of men in everyday life, it is generally used in a religious sense to express one's relation to God. The system of sacrifice established by Moses and described in the first sixteen chapters of *Leviticus* (which see) shows very clearly that these sacrifices were made to secure reconciliation of the people with God. The sacrifice was an atonement for sin of the person offering it, and the great sacrifice made by the high priest on the day of atonement, once a year, was an atonement for the sins of the nation.

Little is said about the atonement in the New Testament, but Roman Catholics and



ATRIUM

Type of atrium in Roman homes. See page 494.

Protestants alike agree that Christ, through his death, became the atonement for the sins of the world, and that all men can obtain forgiveness of their sins by believing in Him.

There is, however, considerable difference of opinion among religious sects as to the method by which the forgiveness may be secured. See **SCAPEGOAT**.

ATOPHAN, *at' o fan*, a drug. See **CREAM OF TARTAR**.

ATRIUM, *a' tri um*, in the earliest Roman houses, the room in which the family life was centered; in later times it became the general reception hall. The atrium in the primitive Roman home was a living room, where the family cooked, dined, slept, and received visitors. Here also were the hearth and the household gods beside it (see **LARES AND PENATES**), the relics of the ancestors, and the family altar. (See illustration, page 493.)

The atria in the homes of the wealthy Romans of the time of Augustus and later were beautiful apartments adorned with paintings, statuary, vases, and fountains, and having four columns around the central opening to support the roof. A marble tank, or *impluvium*, below the opening, served to hold rain water. In the houses of Pompeii may be seen atria of all kinds, in a good state of preservation.

ATROPHY, *at' ro fie*, a wasting of any part of the body. For example, after infantile paralysis, certain muscles shrink in size and lose their capacity. Progressive muscular atrophy is a disease of a part of the spinal cord which causes certain muscles to atrophy. See **CIRRHOISIS**. W.A.E.

ATROPOS, *at' ro pahs*, one of the three Fates (which see).

ATTACHÉ, *at ta sha'*, a term applied to a subordinate official attached to an embassy. The duties of such an office are specific. A military attaché observes military affairs; a naval attaché, naval business. See **DIPLOMACY**.

ATTACHMENT, a term in law applied to a court writ authorizing the seizure of a person or the property of one sought for court action. A writ of attachment against persons is now issued only for contempt of court (see **CONTEMPT**). Attachment also means taking into custody of the law the person or property of one already before the court. The original purpose of the writ was to secure the appearance in court of one who had disregarded a legal summons. The grounds upon which a writ for attachment of property may be obtained vary under different laws. It is also used in cases where the debtor is a non-resident, or has left the state, or refuses to comply with a plain mandate of law.

ATTAINDER, *at tayn' dur*. According to old English law, a person sentenced to death or outlawed forfeited all rights to his property, including land and personal belongings, and suffered also *corruption of blood*, which prohibited him from inheriting property or transmitting it to his heirs. Such a loss of civil

rights is known as *attainder*. By act of Parliament, passed in 1870, attainder in England was abolished, and it is now obsolete in practically all civilized countries. In the United States a man may be attainted for the crime of treason, but the Constitution expressly states that punishment cannot extend beyond his life and affect his family. His property passes on his death to his heirs, against whom no penalties can be laid.

Bill of Attainder, a bill or statute, no longer legal in any country, which declares a person to be guilty of an offense named and his property appropriated or confiscated. It is an act of a lawmaking body which pronounces a verdict of guilt upon a man for some alleged offense without giving him a legal trial, or even a hearing. Under such a bill a person found guilty could neither receive nor transmit by inheritance, neither could he testify in any court or claim any rights or legal protection. The Constitution of the United States declares that no state shall pass any bill of attainder, and furthermore explicitly assures any accused person the right to a fair and speedy trial.

ATTAR, *at' ar*, a general term for perfume made from flowers, but used most commonly in connection with *attar*, or *otto*, of roses, the rare and costly oil obtained from the petals of several species of roses which are products of the East. (See illustration, page 495.)

Attar of roses is made chiefly in Syria, Persia, India, Turkey, and Bulgaria. It is the most expensive perfume offered in commerce. To obtain the oil, the rose petals are distilled with about twice their weight of water, the mixture being placed in open vessels and exposed to the night air. In the morning, the thin film of attar which has formed is skimmed off with a feather. The amount of attar obtained from a given number of roses weighs only 1/3000 as much as the whole quantity of petals, yet so powerful is the scent of this oil that one drop will impart fragrance to a gallon of cologne.

This costly oil is often adulterated with sandalwood oil, geranium oil, and other substances, and importers sometimes send spies to the factories where it is made, so that they may know whether or not they are obtaining the pure article.

Various perfumes, including milk of roses and lavender water, are scented with attar, and it is sometimes added to medicines and ointments. A hair oil commonly sold under the name of attar of roses consists of olive oil, coloring matter, and a few drops of attar.

ATTAR OF ROSES. See above; also, **BULGARIA**.

ATTENTION, *at ten' shun*, is the fixing of the mind upon some object or thought for a definite purpose. Sometimes the purpose is immediate, as when we give attention to an object for the purpose of learning what the object is; sometimes it is remote, as when the



Photos: O R O C

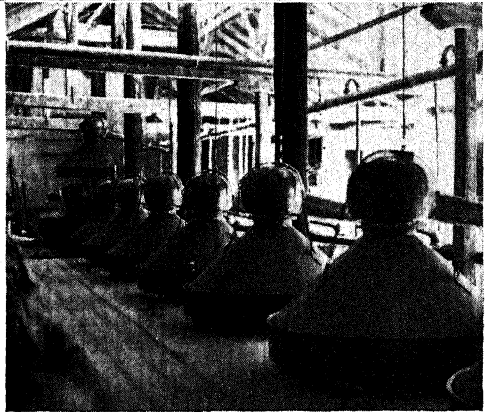
ROSES FOR PERFUMERY

It would seem to be a delightful occupation for these Bulgarian girls, who spend many days gathering roses, but their work is not easy. Below is a row of vats in a rose distillery in Bulgaria. While not the chief industry in that country, the making of perfumes is important. See BULGARIA.

pupil in school gives his attention to a lesson, as in grammar, that in time he may be able to use the English language correctly. Attention is always present in a state of consciousness; that is, when we are awake we always attend to something. We often say that a child is inattentive. What we really mean is that he is not giving attention to the subject in hand. His attention is where his interest lies.

The best of modern authorities recognize three phases of attention, to which they have given different names, such as *non-voluntary*, *voluntary*, and *acquired*, or *passive*, *active*, and *secondary passive*. Whatever the terms used in describing these phases, the meaning is the same.

Passive Attention. Passive, or non-voluntary, attention is that phase of attention which requires no effort on the part of the individual. Loud sounds, bright lights, peculiar odors force themselves upon us, as it were, without any effort on our part. Again, the child's attention primarily is directed by those external objects which make the strongest impression upon his mind through the special senses. He is attracted by a bright flower, the flitting of a butterfly, the song of a bird, the rippling of a brook, or any other object which makes an impression through the avenues of the special senses; but there is no definite purpose in it all.



Active Attention. Active, or voluntary, attention is directed by the will for a definite purpose. The purpose is more or less remote, but it is the ultimate good upon which the attention is fixed, and between the present status of the individual and that goal there may be many long steps, each requiring special attention before the succeeding step can be taken. In such a case, each step becomes a goal leading to the ultimate end. To illustrate: A boy is promised that he may go to a circus that is to exhibit in the neighborhood in two weeks, provided he will finish certain tasks. He gives his attention to his work not merely for the sake of completing the tasks, but because of what to him seems the greater, but more remote, good, the privilege of going to the circus. The ultimate end makes a strong appeal, and he works with a will to secure it. Were school tasks made equally attractive,

Outline and Questions on Attention

I. Definition

- (1) The act
- (2) The purpose

II. Phases

- (1) Passive or non-voluntary
 - (a) Without effort
 - (b) Without purpose
 - (c) First step toward active attention
 - (d) Characteristic of the child
- (2) Active or voluntary
 - (a) Directed by will
 - (b) Definite purpose
 - (c) Characteristic of adult
- (3) Secondary passive or acquired
 - (a) Difference from active one of degree
 - (b) Effort required
 - (c) Cultivation of habit

III. Importance in Education

- (1) First step to knowledge
- (2) Grows with practice
- (3) Selective nature
- (4) Importance of relaxation

Questions

When a teacher says, "This is the most inattentive child in the class," what does she really mean?

If your eye is unconsciously caught by a brilliantly lighted sign and you stop to discover what the sign says, what process has taken place?

Is it wise to expect a child to solve his arithmetic problems just before he goes to bed? Why?

Can you at any time actually be attentive to nothing?

Can a person who has never learned to hold his attention fixed on one idea be considered well educated?

Why can you not fix your attention for a half hour upon the fact that "Two times two are four"?

What is the difference between active and secondary passive attention?

What sort of attention is it that registers the sound of a revolver shot?

How can a young person determine the sort of things which shall claim his attention when he grows older?

What did Joseph Cook call the "grandmother of knowledge"?

Why is it difficult to do as much and as good work as usual amid new surroundings?

Why is attention weaker at night than early in the day?

pupils would work at their lessons with equal interest and zeal.

Passive attention merges into active attention so easily that we often fail to recognize the change. Just as soon as we begin to give our attention to an object which was forced upon us for the purpose of gratifying our curiosity about it, our attention has become active. Passive attention is, therefore, in children, and frequently in adults, the first step toward active attention. Passive attention is characteristic of the young child; active attention characterizes the adult.

Secondary Passive Attention. Secondary passive attention, or acquired attention, differs from active attention only in degree. It may best be illustrated by the condition in which a man finds himself when he begins a new occupation or takes a position which places him amid unfamiliar surroundings. At first, there are so many strange sights and sounds that intrude themselves upon his consciousness that it is with the greatest difficulty that he can hold his mind upon the work before him. In course of time, however, the new becomes commonplace. Each day his task becomes easier, until in a few weeks he finds that it requires little or no effort to keep his mind upon his work. In other words, *he has formed the habit of attending to his work. But he has formed it by effort.*

Place of Attention in Education. Attention is the first step in gaining knowledge. Joseph Cook said:

Interest is the mother of attention, and attention is the mother of knowledge. If you would win the daughter, be sure of the mother and grandmother.

Sir Isaac Newton said that he was able to accomplish what others failed to do because he could hold his attention upon a problem for a longer time than they could. Training in attention is essential to a well-disciplined mind.

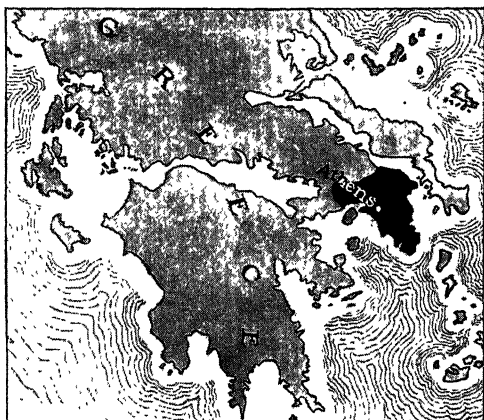
Attention grows with the development of the mind. It is stronger in the adult than in the child. It is a selective activity; whatever ideas are in our minds are there because at some time in life we chose to put them there. Attention can be fixed only upon those objects and ideas that have some meaning; that is, which point to something big in themselves.

Attention can be held only for a short time upon an object that does not change. In the acquisition of knowledge, the mind is active; it requires that the material upon which it works should be active also.

Attention causes fatigue, hence it becomes weakened when exercised for a long time. It is usually weaker toward the close of the day than in the morning. In the training of children, periods requiring active attention should be followed by periods of relaxation. C.E.S.

Related Subjects. The reader is referred to the articles **PSYCHOLOGY**; **MEMORY** (Helping the Memory); **WILL**, in psychology.

ATTICA, *at' i kah*, a district of Greece on the extreme southeast coast, celebrated as the home of the ancient Athenians, through whose genius



ATTICA

Location of the district, both in ancient and modern times.

Grecian art, literature, and philosophy reached their greatest heights. Attica is a triangular peninsula jutting into the Aegean Sea, and Athens is its historic city. Its surface is mountainous, the soil is light and thin, and the coast is indented by numerous bays and harbors. The early inhabitants had to use the greatest care in the practice of agriculture, which fostered habits of industry, while the coast, with its line of natural harbors, made them a seafaring race and encouraged trade and commerce. The clear air of this region, and the brilliant blue of its skies, praised by poets from ancient times, are said to have been a wonderful inspiration to the Athenians. Milton's lines in this connection are well known:

Where, on the Aegean shore, a city stands,
Built nobly, pure the air, and light the soil—
Athens, the eye of Greece.

Modern Attica is a division, more correctly, a province, of Greece. See **ATHENS**; **GREECE** (History).

ATTILA, *at' tilah*, a famous king of the Huns whose merciless treatment of conquered peoples gave him among the Christians of the fifth century the name "Scourge of God." In 433 he became joint ruler with his brother, Bleda, over countless hordes of fierce barbarians in Northern Asia and Europe; ten years later he caused his brother to be put to death, afterward ruling alone. In 447 he laid waste all the countries between the Black Sea and the Mediterranean, easily defeated the weak Theodosius II, ruler over the Eastern Roman

Empire, overran Thrace, Macedon, and Greece, then forced the emperor to grant him territory south of the Danube and to pay him large tribute every year.

Gaul was invaded in 451, but in the famous Battle of Châlons the Huns were completely defeated by the Roman army of the West, commanded by Aëtius and Theodoric, king of the Visigoths. In the following year, Attila resumed his terrifying work of conquest, and Rome itself was saved only by the personal plea of Pope Leo I. In 453, on the night of his marriage with the beautiful Hilda (or Ildico), Attila died very suddenly, in the midst of preparations for another invasion of Italy. Whether he died at the hands of a friend of Rome, was killed by the bursting of a blood vessel, murdered by his reluctant bride, or died from his own intemperate excesses, has never been determined to the satisfaction of historians.

ATTLEBORO, MASS. See **MASSACHUSETTS** (back of map).

ATTORNEY. See **LAW**.

ATTORNEY, POWER OF. See **POWER OF ATTORNEY**.

ATTORNEY-GENERAL. See **JUSTICE, DEPARTMENT OF**.

ATTRACTION, *at trak' shun*, in physics, is the force through which particles or bodies of matter belonging to the same system are drawn toward one another. *Gravitation*, whereby the planets are held in their relative positions in the solar system and falling bodies are drawn to the earth, is an example of attractive force which operates universally. Other illustrations of attraction are *cohesion*, the force that holds like molecules together; *adhesion*, the force that holds together unlike molecules; *magnetic attraction*, represented by the pulling up of iron filings when a horseshoe magnet is held near them; and *electrical attraction*, illustrated by the drawing near of a pith ball to an electrified body.

In chemistry, attraction is represented by the force through which different elements enter into chemical combination. This force, which is known as *chemical affinity*, is illustrated by the union of hydrogen (two atoms) and oxygen (one atom) to form a molecule of water, whose symbol thus becomes H₂O. See **CHEMISTRY** (Chemical Compounds). A.L.F.

Related Subjects. The reader is referred in these volumes to the following articles:

Adhesion	Gravitation
Cohesion	Magnetism
Electricity	Molecule

AUBURN, ME. See **MAINE** (back of map).

AUBURN, N. Y. See **NEW YORK** (back of map).

AUCKLAND, the capital of New Zealand and of a province of the same name. See **NEW ZEALAND** (The Cities).

AUCTION, *awk' shun*, a form of sale where goods are offered publicly by open bidding, and must be sold to the person offering the highest price. The owner of the property offered for sale may personally or through an authorized agent make bids on the articles to be sold, in order to prevent their being sold for too low a price, but if he should employ different agents to bid against each other in order to force the price upward, his action would be illegal. Put differently, mock bidding to raise the price by apparent competition is contrary to law. The auctioneer, or person in charge of an auction, may refuse to sell an article if only one bid is received, but upon his receiving a second bid, the sale must continue. When the final bid on an article has been offered, a binding contract has been made (see **CONTRACT**). F.H.E.

AUCTION BRIDGE, a game with cards. See **BRIDGE**, subhead.

AUDIO, *aw' di o*, **FREQUENCY**. See **RADIO COMMUNICATION**.

AUDIT BUREAU OF CIRCULATIONS. See **ADVERTISING**.

AUDITOR, *aw' di ter*, an officer whose duty it is to examine accounts. Auditors for the various departments of any government examine the accounts of the officials in their respective departments. The auditor for a state or province examines the accounts of the state or provincial treasurer, and in most cases approves all bills before they can be paid. It is also his duty to see that the expenditures for any purpose do not exceed the specified appropriation.

An increasing number of business concerns, large and small, employ auditors periodically to make a painstaking examination of all books, records, and accounts and to report their findings. Those auditors who have passed state examinations entitling them to practice as certified public accountants command highest confidence. See **ACCOUNTANCY**. F.H.E.

AUDITORY MEATUS, *me a' tus*, one of the parts of the external ear. See **EAR**.

AUDUBON, *aw' doo bahn*, **SOCIETY**, an organization formed for the protection of birds. This association, named for the great bird-lover, John James Audubon, has done much to prevent wanton destruction of birds for their plumage or as sport, and has been successful in creating sentiment against the wearing of birds and feathers on millinery. In almost every part of North America societies exist, with a membership totaling scores of thousands. In addition, thousands of women not enrolled as members have pledged themselves to refrain from wearing any ornaments which require the killing or maiming of birds. Many states and provinces have adopted laws which forbid the killing at any time of non-game birds, and it is chiefly due to the Audubon

societies that large tracts of ground have been set apart as bird reservations (see **BIRD**, subhead).

The official organ of the National Association of Audubon Societies is *Bird-Lore*, a magazine which, because of its popular, non-technical character, commends itself to bird-lovers who, strictly speaking, are not bird students. Information as to methods of organizing a society or as to the specific aims of the association may be obtained from National Audubon Societies' headquarters, New York City.

John James Audubon (1780-1851) did perhaps more than any other man to interest Americans in their native birds. He was born at Mandeville, La., of French parents, studied in France, and was taught drawing. In 1798 he settled near Philadelphia, where he lived for ten years, devoting himself to the study of birds; later he spent much time in the West, where it was his great pleasure to wander about the woods and watch his feathered friends. In 1826, Audubon went to England, exhibited his drawings of birds, and finally published them in a great work containing 435 life-sized colored plates of birds, entitled *The Birds of America*. A copy of this complete work to-day is worth about \$2,000. Later there appeared an accompanying text entitled *Ornithological Biography*, partly written by William McGillivray.

On his return to America, Audubon labored with Dr. John Bachman on a finely illustrated work entitled *The Quadrupeds of America*. His great merit is the accuracy and extent of his original observations. Audubon did not institute a movement for the preservation of birds, for in his day much of the country was wild, and there seemed to be no danger that birds would ever become extinct; but his genuine love for them justifies the naming of the Audubon Society for him.

AUGEAN, *aw je' an*, **STABLES**, in Greek and Roman mythology, were the stables of King Augeas, which, after thirty years of neglect, were cleansed in a single day. Augeas kept in these stables his famous 3,000 head of oxen. Hercules, commanded to perform twelve great labors as a punishment for having slain his children, was given as his sixth task the cleansing of the stables in one day. This gigantic feat he accomplished by turning into the stalls the Alpheus and Peneus rivers, whose waters entirely washed away the filth that had been collecting for thirty years. See **HERCULES**; **MYTHOLOGY**.

Modern Application. At the present time the expression, "cleansing the Augean stables," is often used in a figurative sense, and is applied to the work of a reformer who tries by personal labor or by publicity to remedy shameful political conditions.

AUGITE, *aw' jite*. See **PYROXENE**.

AUGSBURG. See **GERMANY** (Principal Cities).

AUGSBURG, PEACE OF. See **CHARLES** (V, Holy Roman Empire).

AUGSBURG CONFESSION, the most important statement of their religious beliefs that the Protestants drew up during the

Reformation, and at the present time the basis of the Lutheran faith. Emperor Charles V, hoping to smooth out the difficulties between the Catholic and Protestant parties in Germany, called a meeting, or diet, at Augsburg in 1530, and requested the Protestants at that time to present a statement of their beliefs. Luther was unable to attend the diet, and the confession was therefore drawn up by Philip Melancthon, one of the great Protestant leaders, and revised by Luther before being read. Charles V and the Catholics would not accept the document, and the division in the Church became permanent. Later, when the English religious leaders drew up the Thirty-Nine Articles of the Church of England, they used the Augsburg Confession as a basis for their work.

G.W.M.

Related Subjects. The reader is referred in these volumes to the following articles:

Charles V (Holy Roman Empire) Melancthon, Philip
Luther, Martin Thirty-Nine Articles

AUGSBURG SEMINARY. See MINNEAPOLIS (Minn.).

AUGURS, *aw' gurz*, a sacred college among the Romans, whose members interpreted the

will of the gods and foretold the future from various signs and omens. These omens were signs in the sky, especially thunder and lightning; the flight and cries of birds; the feeding of the sacred chickens; the movements and sounds of serpents and other animals; and chance happenings, such as the gnawing of a mouse or the creaking of a chair, which occurred before or during the augural ceremony. (See SUPERSTITION and its allied subjects.)

The augurs were consulted before anything of importance was undertaken, and they could dismiss a meeting of the people merely by saying *alio die* (on another day). In early times when the college was composed of nobles, the augurs sometimes used their power unjustly to keep the plebeians from holding a meeting. This college at first consisted of three members, but this number had increased to sixteen by the time of Caesar. The augurs were always men of distinction, and wore the toga with the wide purple border (see TOGA).

In Modern Speech. To-day *augur* and *cugury* are used in the sense of *foretelling* or *anticipating*, and often with an impersonal subject, as, "It *augurs* ill for our plans that we cannot all agree."



AUGUST, the eighth month of the calendar year, was named for the Roman Emperor Augustus, one of the greatest rulers that ever lived; and there is indeed something royal about it. It is a month of gold and purple—its sun throws a "golden glory" on the yellowing fields, and everywhere there are goldenrod and purple aster. It is one of the warmest months of the year in the northern hemisphere, and usually one of the stillest, so its heat is likely to be the "sweltering" variety. Its special flower is the poppy, and its gem the sardonyx.

History of the Month. In Rome, during the days of the republic, the year began with March, and August was the sixth month, as its Latin name, *Sextilis*, declares. But after Julius Caesar made his reforms in the calendar, it became the eighth (see CALENDAR). This alone would not have led to its renaming, but Julius Caesar rechristened the month of July for himself, and his successor, Augustus, desired a like honor. Requested to make his choice, he took his "lucky month"—the month in which he had been elected consul, had three times celebrated a triumph, and had completed the conquest of Egypt. But here a

difficulty arose. July had thirty-one days, and the newly named month had but thirty; and thus Julius was yet more honored than Augustus. Since this did not accord with the ambition of the latter, a day was taken from February, already the shortest of the months, and given to August.

In the United States, as in Canada, there is no general holiday in August, but several of the states have set special days apart for observance. Colorado celebrates the first of August, the date of its admission to the Union, and Missouri the tenth, for a similar reason; while Vermont observes with fitting ceremonies the sixteenth, the anniversary of the Battle of Bennington. (See pages 500-501.)

AUGUSTA, *aw gus' tah*, GA., probably the largest cotton-manufacturing center of the South, and the second largest inland cotton market in the world. The number of its cotton factories (eleven) has given it locally the name of the *Lowell of the South*. It claims to be the second largest cottonseed-oil market in the world. The Augusta Canal, nine miles long, constructed at a cost of \$1,500,000, furnishes abundant power for the cotton mills, silk mills, lumber plants, and brick

AUGUST CALENDAR

Birthdays

1. Richard Henry Dana, 1815
2. F. Marion Crawford, 1854
4. Percy Bysshe Shelley, 1792
6. Alfred Tennyson, 1809
Lord Strathcona and Mount Royal, 1820
8. Nelson A. Miles, 1839
9. Izaak Walton, 1593
Francis Scott Key, 1780
10. Herbert Clark Hoover, 1874
12. Robert Southey, 1774
13. Goldwin Smith, 1823
14. Sir James Douglas, 1803
Ernest Thompson Seton, 1860
15. Napoleon Bonaparte, 1769
Sir Walter Scott, 1771
- Thomas De Quincey, 1785
17. David Crockett, 1786
18. Virginia Dare, 1587
Meriwether Lewis, 1774
19. James Nasmyth, 1808
20. Benjamin Harrison, 1833
22. John B. Gough, 1817
24. William Wilberforce, 1859
25. Francis Bret Harte, 1839
26. Sir Robert Walpole, 1676
28. Sir Edward Burne-Jones, 1833
29. John Locke, 1632
Oliver Wendell Holmes, 1809
31. Elizabeth Stuart Phelps, 1844

History

1. Columbus first landed on American continent, 1502
Battle of the Nile, 1798
Colorado admitted to the Union, 1876
Germany declared war on Russia, 1914
2. Henry Hudson first entered Hudson Bay, 1610
German invasion of Belgium, 1914
President Harding died, 1923
3. Columbus sailed from Spain on his first voyage, 1492
United States vessels bombarded Tripoli, 1804
4. All titles of nobility abolished in France, 1789
Chinese exclusion law went into operation in United States, 1882
Cardinal Sarto elected Pope as Pius X, 1903
5. Sir Humphrey Gilbert landed at Saint Johns, Newfoundland, 1583
First partition of Poland, 1772
England declared war against Germany, 1914
6. Holy Roman Empire ceased to exist, 1806
7. Battle of Thermopylae, 480 B.C.
British entered Lhasa, Tibet, 1904
8. Bonaparte sailed from England for Saint Helena, a prisoner, 1815.
9. Webster-Ashburton Treaty signed at Washington, 1842
Edward VII of England crowned, 1902
10. Missouri admitted to the Union, 1821
Russian and Japanese peace commissioners met at Portsmouth, N. H., 1905
11. Fulton's *Clermont* made a trial trip, 1807
Settlement of boundary between Ontario and Manitoba, 1884
12. First American railway joined Schenectady and Albany, N. Y., 1830
United States and Spain signed peace proposals, 1808
France and England declared war on Austria, 1914
13. Mexico City captured by Spaniards, 1520
Manila surrendered to United States, 1898
Norway voted for separation from Sweden, 1905
14. Foreign armies entered Peking to relieve legations, 1900
15. Fort Dearborn massacre, 1812
Lafayette returned to visit America, 1824
16. Battle of Bennington, 1777
General Brock captured Detroit, 1812
18. Kearny took Santa Fe, New Mexico, 1846
19. *Guerrière* surrendered to the *Constitution*, 1812
Parliament passed bill for Union of South Africa, 1909
Battle of Lorraine began, 1914
20. Pilgrims sailed from England on *Mayflower*, 1620
21. Lincoln-Douglas debates began, 1858
22. Battle of Bosworth, 1485
23. Germans began attack on Mons, France, 1914
24. Massacre of Saint Bartholomew, 1572
British took Washington, D. C., and burned the Capitol, 1814
25. Two hundred inhabitants of Montreal killed by Iroquois Indians, 1689
27. English captured Fort Frontenac, Canada, 1758
Battle of Long Island, 1776
Louvain burned by Germans, 1914
28. British Parliament abolished slavery in the colonies, 1833
Montenegro proclaimed an independent kingdom, 1910
29. Melbourne, Victoria, founded, 1835
30. Massacre of Fort Mims, 1813
Second Battle of Bull Run, 1862
31. Earthquake at Charleston, S. C., 1886

For Study

Butterfly
Caterpillar
Lily
Molting

Poppy
Pewee
Rice
Seed Dispersal

Wheat
Thistle
Summer Heavens (see ASTRONOMY)
Vireo

AUGUST QUOTATIONS

1. All the long August afternoon,
The little drowsy stream
Whispers a melancholy tune
As if it dreamed of June,
And whispered in its dream. *Howells.*
2. But pleasures are like poppies spread,
You seize the flow'r, its bloom is dead. *Burns.*
Pleasures lie thickest where no pleasures seem;
There's not a leaf that falls upon the ground
But holds some joy of silence or of sound,
Some sprite begotten of a summer dream. *Blanchard.*
3. And ye shall succor men;
'Tis nobleness to serve:
Help them who cannot help again. *Emerson.*
4. Music, when soft voices die,
Vibrates in the memory. *Shelley.*
5. Be strong!
It matters not how deep entrenched the wrong;
How hard the battle goes, the day how long;
Faint not—fight on.
To-morrow comes the song. *Babcock.*
6. The sixth was August, being rich arrayed
In garment all of gold down to the ground. *Judd.*
7. Not in the clamor of the crowded street,
Not in the shouts and plaudits of the throng,
But in ourselves are triumph and defeat. *Longfellow.*
8. The simple faith remains that He
Will do, whatever that may be,
The best alike for man and tree. *Whittier.*
9. Sweet is pleasure after pain. *Dryden.*
10. In the parching August wind,
Cornfields bow the head,
Sheltered in round valley depths,
On low hills outspread. *Rosselli.*
11. Nor knowest thou what argument
Thy life to thy neighbor's creed hath lent. *Emerson.*
12. The dew is gleaming in the grass,
The morning hours are seven,
And I am fain to watch you pass,
Ye soft white clouds of heaven. *Lampson.*
13. The August cloud * * * suddenly
Melts into streams of rain. *Bryant.*
14. Not what we give, but what we share,
For the gift without the giver is bare;
Who gives himself with his alms feeds three—
Himself, his hungry neighbor, and me. *Lowell.*
15. The word *impossible* is not in my dictionary. *Napoleon.*
16. The bravest are the tenderest,
The loving are the daring. *Taylor.*
17. What I kept, I lost.
What I spent, I had.
What I gave, I have. *Persian Proverb.*
18. They can conquer who believe they can. *Emerson.*
19. In the first drowsy heat of August noon—
Comes the plumed goldenrod with flaunting
train,
And lifts her yellow head along the way. *Judd.*
20. Dream not helm and harness
The sign of valor true;
Peace hath higher tests of manhood
Than battle ever knew. *Whittier.*
21. Whether we climb, whether we plod,
Space for our task the scant years lend—
To choose some path that leads to God
And keep it to the end. *Reese.*
22. The brilliant poppy flaunts her head
Amidst the ripening grain,
And adds her voice to swell the song
That August's here again. *Winslow.*
23. Why, courage then! what cannot be avoided
'Twere childish weakness to lament or fear. *Shakespeare.*
24. In the world's broad field of battle,
In the bivouac of life,
Be not like dumb, driven cattle—
Be a hero in the strife. *Longfellow.*
25. Through all the long midsummer day
The meadow-sides are sweet with hay. *Trowbridge.*
26. Small service is true service while it lasts—
The daisy, by the shadow that it casts,
Protects the lingering dewdrop from the sun. *Wordsworth.*
27. The sun has drunk
The dew that lay upon the morning grass;
There is no rustling in the lofty elm
That canopies my dwelling, and its shade
Scarce cools me. *Bryant.*
28. They serve God well
Who serve his creatures. *Norton.*
29. Sin has many tools, but a lie is the handle
which fits them all. *Holmes.*
30. I dare do all that may become a man;
Who dares do more is none. *Shakespeare.*
31. How beautiful is the rain!
After the dust and heat,
In the broad and fiery street,
In the narrow lane,
How beautiful is the rain! *Longfellow.*
It is not raining rain to me,
It's raining daffodils;
In every dimpled drop I see
Wild flowers on distant hills. *Loveman.*

factories of the city. It was near Augusta that the first cotton gin was invented and operated by Eli Whitney, and here the first steam-propelled boat was floated by James Longstreet in 1806, a year before the Fulton exploits were known. From the State Medical College came Dr. Crawford Long, the discoverer of ether as an anesthetic.

The city is located at the head of navigation on the Savannah River; it is the county seat of Richmond County, on the South Carolina border. Charleston, S. C., is 145 miles southeast; Atlanta, about 171 miles northwest. Climatic conditions make Augusta a favored winter resort; tourist hotels are situated on the hilltops surrounding the city. Population, 1928, 56,700 (Federal estimate).

History. Augusta was founded in 1735 by General James Oglethorpe, founder of the colony of Georgia. A Celtic cross now marks the site of Fort Augusta, which was named in honor of the Princess Augusta, daughter of George II. In 1798, it was incorporated as a city. Fort Cornwallis and Fort Grierson were located here; General Henry Lee, known in history as "Light-Horse Harry," was one of the leaders in the capture of these two forts, which feat drove the English from Augusta. From 1790 to 1796 it was the capital of the state. The government maintains an arsenal here for the storage of arms and ammunition; it is the only one in the South, east of the Mississippi. The city is the burial place of three of the signers of the Declaration of Independence, Hall, Walton, and Guinnett.

Education. The Medical Department of the University of Georgia, established in 1828, is located here, together with the University Hospital, and the Wilkenford Children's Hospital. Richmond Academy, one of the oldest in the South, Mount Saint Joseph Academy, and Paine Institute (colored) also serve the educational needs.

Railroads. Transportation facilities are afforded by the Georgia, Central of Georgia, Southern, Charleston & Western Carolina, Atlantic Coast Line, and Georgia & Florida railways. By steamer, the river is navigable to Augusta. C. OF C.

AUGUSTA, ME. See MAINE (back of map).

AUGUSTAN AGE. See AGE (Historic Ages).

AUGUSTA SANDSTONE BRIDGE. See NATURAL BRIDGE.

AUGUSTINE, *aw' gus tine*, SAINT (AURELIUS AUGUSTINUS) (354-430), a renowned Christian theologian, ranking first among the great early fathers of the Church. He was born at Tagaste, in Numidia, North Africa, and as a youth showed such promise that his father gave him the best education then possible. After finishing his schooling at Carthage, he became a teacher of rhetoric and grammar. Though his mother was a Christian and a woman of sincere and tender piety, Augustine

did not accept Christianity until he was thirty-two years of age. From the time he was nineteen, he sought eagerly for the truth, taking up one system of philosophy after another, and finding in none the power that could free him from the vicious habits which he had acquired in his boyhood. About 384, he went to Milan to accept a position as teacher of rhetoric, and there, coming under the influence of Saint Ambrose, bishop of Milan, was converted in 386.

Augustine's conversion is an important event in the history of the Catholic Church, for, having consecrated his mighty intellect to its service, he produced a great body of writings on theology that have had profound influence from his age to the present time. He became bishop of Hippo (in North Africa) in 395, and labored there until his death, which occurred during the famous siege by the Vandals, in the year 430. Two of Augustine's works, *The City of God* and his *Confessions*, are to be classed among the best-known religious writings of all time. The former is a defense of Christianity and the Christian Church; the latter, a narrative of his early life and conversion.

AUGUSTINE, or **AUSTIN,** SAINT, the Apostle of the English, and the first archbishop of Canterbury. While a monk in the monastery of Saint Andrew, Rome, he was summoned by Pope Gregory I (see GREGORY) to lead a band of missionaries to England. In 597 they landed on the island of Thanet, southeast of England, and were there kindly welcomed by Ethelbert, king of Kent. Through the preaching of Saint Augustine and his followers, thousands of the English, including the king, were converted, and in 601 the Pope made Augustine archbishop of Canterbury. The historian Green says of his mission:

The march of the monks as they chanted their solemn litany was in one sense a return of the Roman legions who withdrew at the trumpet call of Alaric. The civilization, art, letters, which had fled before the sword of the English conquerors, returned with the Christian faith.

AUGUSTUS, *aw gus' tus*. This title, meaning *consecrated*, was bestowed upon CAIUS JULIUS CAESAR OCTAVIANUS (63 B.C.-A.D. 14) when he became supreme ruler of the Roman world. Though adopted by all the succeeding emperors, the name is associated particularly with Octavianus, first of the Roman imperial line—the great Emperor Augustus, as he is known in history. He was named Caius Octavius originally, but assumed the personal name mentioned above after the death of his great-uncle, Julius Caesar, because the latter's will revealed that Caesar had legally adopted him and made him his heir.

When Octavius, a youth of nineteen, heard of his uncle's assassination, he was study-

ing at the Greek colony of Apollonia, in Illyria. At once he departed for Italy, learned of his adoption into the Julian line, took over



AUGUSTUS

This statue of Caius Julius Caesar Octavianus stands in the Vatican, Rome.

his new name, and was soon involved in the political controversies of the dying republic. (For the political background of this era, see the article *ROME*).

At first Octavianus sided with the Senate against the pretensions of Mark Antony, and commanded some of the soldiers who defeated Antony at Mutina (43 B.C.). Having won the consulship because his devoted soldiers demanded his election, Octavianus became reconciled with Antony, and the two, with Lepidus, formed the Second Triumvirate. In the proscription which followed, 300 Senators and 2,000 knights were executed, Cicero being one of the victims. The triumvirs proceeded to divide the western provinces among them, while Brutus and Cassius, leaders among the conspirators who had put Caesar to death, represented the republic in the East.

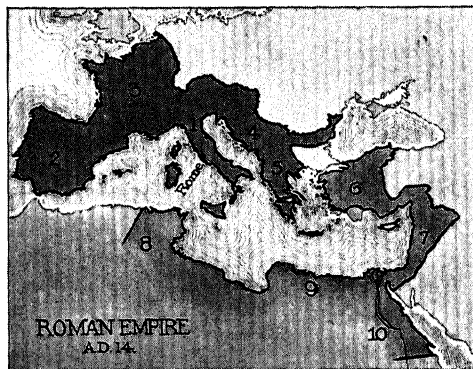
Rise to Power. In 42 B.C., Octavianus and Antony were ready to crush their rivals; all hope of reviving the republic was lost when they defeated Brutus and Cassius at Philippi. Eventually, the eastern provinces were taken over by Antony and the western by Octavianus, while the weak Lepidus, after being assigned to Africa, was finally compelled to retire to private

life. Between 36 and 31 B.C., the energy of Octavianus was directed toward the consolidation of his own power and toward winning the confidence of the Roman people, who were growing increasingly irritated at the excesses of Antony at the court of Cleopatra, in Egypt. War was declared, and in September, 31 B.C., at Actium, Antony's fleet was overwhelmingly defeated; within a year both he and Cleopatra committed suicide.

On the return of the new Caesar to Rome, a three days' triumph was celebrated, and as the highest offices of state were gradually taken over by him, the people honored him as the preserver of their country and the friend of peace and order. When, in January, 27 B.C., a regular and constitutional system of government had been established, with Octavianus as the chief magistrate, the Senate voted him the title *Augustus*, and Rome entered upon the era of its greatest expansion. It was during this reign that Christ was born.

Achievements. Though the name and many of the functions and offices of the republic were retained, the realm over which Augustus ruled was in effect an empire. Not only did he institute and maintain order in Rome, but he saw to it that the people of the provinces were made happy and contented by a wise and just rule, and it is not overpraising him to say that he was the preserver of a civilization which lasted for over two centuries. At home he encouraged art and literature, giving the name *Augustan* to the age of Vergil, Horace, Ovid, and Livy.

His activity in the embellishment of Rome has given rise to the well-known saying, "He



EXTENT OF EMPIRE AT DEATH OF AUGUSTUS

- | | |
|-------------|-------------|
| 1—Italy | 6—Asia |
| 2—Spain | 7—Syria |
| 3—Gaul | 8—Numidia |
| 4—Illyricum | 9—Cyrenaica |
| 5—Macedonia | 10—Egypt |

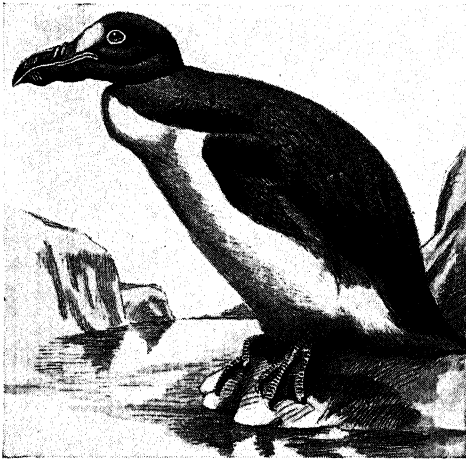
found the city of brick, and left it of marble." After his death, the people revered him as one of their gods. The story of the naming of the

month of August for the great emperor is told elsewhere under AUGUST.

Related Subjects. The reader is referred in these volumes to the following articles:

Actium	Calendar
Antony, Mark	Cleopatra
Brutus	Rome
Caesar, Julius	Triumvirate

AUK, *awk*, a name applied to several species of diving and swimming birds found in Arctic regions, and particularly common on the shores



THE GREAT AUK

of Siberia and Alaska. They are closely related to the grebes and loons and, like them, are very clumsy on land, but swim with great speed both on the surface and under the water. Auks are migratory; they spend the winter on open seas, and go to northern rocky coasts in the spring to breed. In colonies of tens of thousands they make their nesting places on ledges of rock, and there, with no pretense at nest-making, each female deposits one large egg. It is held in place by the webbed feet of the parent bird during the period of hatching. The legs of the auks are placed so far back on the body that the birds when upright appear to stand on their tails. Their wings are of poor service for flight, but are extremely useful as fins in swimming.

The *great auk*, or *garefowl*, formerly inhabited northern regions and occasionally visited the British Isles, but it is now extinct. It was as large as a goose, and of black and white plumage. Eggs of this species, and some stuffed specimens of the bird, are carefully preserved in museums. The *razor-billed auk*, a bird over fifteen inches long, is characterized by a sharp and heavy bill. It breeds in great numbers on the coasts of Labrador and New Brunswick. The *little auk*, or *dovekie*, is a black and white bird, about eight inches in length. It is occasionally found during winter in the regions of the Great Lakes. See GUILLEMOT. D.L.

Scientific Names. Auks belong to the family *Alcidae*. The razor-billed is *Alca torda*; the little, *A. alle*; the extinct great auk, *Plautus impennis*.

AUKLAND, *awk' land*, metropolis of New Zealand (which see).

AULD LANG SYNE, *awld lang sine*. These Scotch words, which mean *old long since*, or *the days gone by*, are the title of a very popular old song, of which the words are generally ascribed to Robert Burns. It seems most probable, however, that Burns merely rewrote a song which had been sung a century and a half before his time, adding two stanzas and giving to the whole the touch of his unique genius. The music, which seems one with the words, is an old Scottish air. Few songs are sung oftener or with greater feeling than *Auld Lang Syne*. The first stanza and the refrain follow:

Should auld acquaintance be forgot,
And never brought to min'?
Should auld acquaintance be forgot,
And days o' auld lang syne?

For auld lang syne, my dear,
For auld lang syne,
We'll tak' a cup o' kindness yet,
For auld lang syne.

AURELIAN, *aw re' li an*, LUCIUS DOMITIUS (AURELIANUS) (about 212-275), a Roman emperor whose firm and vigorous rule in an age of disorder and unrest gave him the title "Restorer of the Empire." Of humble birth, he rose to the highest rank in the army, and on the death of Claudius II, in 270, was chosen emperor by the soldiers. He freed Italy from the barbarians, conquered the famous Zenobia, queen of Palmyra, and followed up his victories by introducing reforms and restoring order throughout the empire. He had many public works and buildings erected, and to him also are due the enlargement and restoration of the walls of Rome. Aurelian was assassinated while heading an expedition against the Persians. See ZENOBIA.

AURELIUS, *aw re' li us*, MARCUS (121-180), the last of the "five good emperors" of Rome, and noted also as a philosopher, was famed for his gentleness and sweetness of character. It has been said of him that he "devoted himself to the task of government with a single view to the happiness of his people." He came to the throne in the year 161, succeeding his foster-father, Antoninus Pius. Early in his reign he was forced to send an army against the Parthians, and his victorious soldiers brought home with them, in 165, a terrible Asiatic plague that swept off vast numbers of his people. In the midst of this national distress came news of the uprising of the barbarians in the regions beyond the Alps, and Aurelius, placing himself at the head of his legions, hastened to the protection of the Roman frontiers. The greater part of his life thereafter was spent



THE FAMOUS "AURORA"

Reproduced from the painting by Guido Reni.

in the camp or on the battlefield, in the effort to keep back the various Germanic tribes, and he died from the effects of this campaigning, in the nineteenth year of his reign.

Aurelius was naturally a student and a lover of peace, and his *Meditations*, much read to-day, have more of the spirit of Christ's teachings than any other pagan writings. Though his reign was marred by bitter persecution of the Christians, he permitted these because he believed the Christians menaced the prosperity of the empire. He ruled wisely and justly, and after his death the people honored him as a god.

AURICLE, *aw' ri k'l*. See **HEART**; **EAR**.

AURIGA, *aw ri' gah*, **THE WAGGONER**, or **CHARIOTEER**, in astronomy is the name of a constellation to the east of Perseus (see chart of the heavens, under **ASTRONOMY**). The principal star, Capella, is larger and very much brighter than the sun. In mythology, the Charioteer is supposed to be Phaëthon, son of Apollo, who borrowed Apollo's chariot and horses and was overthrown when trying to drive them. Capella represents a goat, probably Amalthea, which suckled the infant Hercules. See **MYTHOLOGY**, for the story of Phaëthon. F.B.L.

AURORA, *aw ro' rah*, in Greek and Roman mythology, is the goddess of the dawn, the radiant messenger who opened the gates of the East, that the sun god in his chariot might drive up the sky. Her rosy fingers and yellow robe represented the glowing colors which appear in the heavens before the sun rises. Aurora was a somewhat fickle goddess, and bestowed her love in turn upon Orion (which see), Tithonus, and Cephalus.

Literature is enriched with references to this goddess. In Homer's *Odyssey* (Book III) are these lines:

But when Aurora, daughter of the dawn,
With rosy lustre purpled o'er the lawn.

In *Midsummer Night's Dream* (Act III, Scene 2) Shakespeare makes this reference:

For night's swift dragons cut the clouds full fast,
And yonder shines Aurora's harbinger;
At whose approach ghosts, wandering here and there,
Troop home to churchyards.

Aurora in Art. The youthful goddess has always been a favorite in art, and various are the representations of her. Burne-Jones pictures her as a graceful, light-footed maiden, walking through quaint Old-World streets which she is wakening to life by her clanging cymbals. But by all means the most famous painting of Aurora is by Guido Reni (which see). It is a ceiling decoration in the Casino Rospigliosi at Rome, and the thousands of visitors who flock every year to see it are enabled to do so without discomfort by means of the great mirror which has been placed beneath it. In this picture Apollo rides on the clouds in his chariot, driving his four horses with his left hand. About him cluster the hours, and above the horses flies the winged torch-bearer, Lucifer. In front, looking back at Apollo, floats the graceful Aurora, who bears in her hand flowers which she is apparently about to drop upon the sleeping world below. The coloring in this masterpiece of Guido Reni is particularly warm and pleasing.

AURORA, **ILL.** See **ILLINOIS** (back of map).

AURORA AUSTRALIS, *aws tra' lis*. See **AURORA BOREALIS**.

AURORA BOREALIS, *aw ro' rah bo re a'-lis*, or **NORTHERN LIGHTS**, the northern polar lights, a peculiar stream of light of great beauty, seen a short time after sunset and continuing sometimes through the night. The *Aurora Australis* is the corresponding light seen in the southern hemisphere.

The path of light usually forms a fiery arch across the northern sky, centered approxi-

mately over the magnetic pole, with its ends on the east and west horizons, and its streams of light ascend from a line of haze or cloud sometimes to a point almost directly overhead.

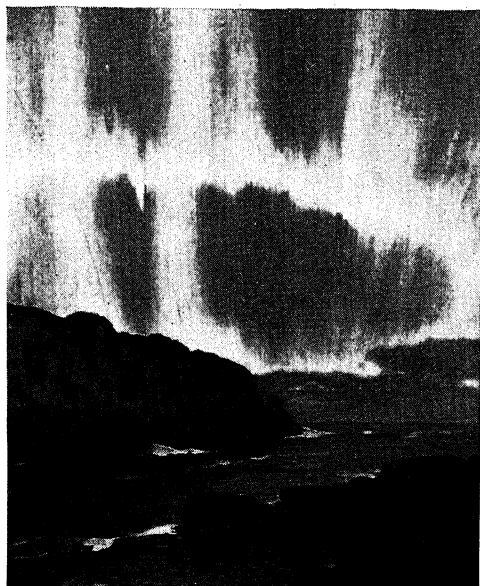


Photo: American Museum of Natural History

AURORA BOREALIS

Characteristic appearance of this glory of the northern sky.

Its rays are transient and constantly in motion, varying in color from a greenish hue or a pale yellow to a deep, blood red, and its shapes are infinite in number. The zone wherein the aurora is seen most frequently in the northern hemisphere has its center near the southern part of Hudson Bay. As one travels south of that point, the aurora is observed less frequently; near the equator it is rarely seen. The displays occur at altitudes of 60 to 450 miles, but the bases of the light streamers sometimes reach nearly to the earth.

Various explanations have been offered to account for these auroras. The theory most commonly advanced is that the displays are caused by the encounter of electrons from the sun with gases, such as krypton and nitrogen, in the upper rarefied atmosphere. It has long been observed that the magnetic needle is subject to disturbances during the appearance of an aurora, and that magnetic storms are an accompaniment of sun-spot activity. See ELECTRICITY; MAGNET. F.B.L.

AUSABLE CHASM, *aw sa' b'l kaz'm*, a picturesque gorge on the Ausable River in New York, one of the most attractive spots in the state. Hundreds of tourists visit it each year, either on foot or in the small boats which ply the river. It is about two miles long, and in some places its vertical walls are 175 feet

high. On both sides steep ravines, overgrown with dusky cedars and pines, lead into it, and a walk along the edge of the precipices and over the bridges which arch these fissures well repays the visitor. Geologists also find formations there which are of interest and importance. Ausable Chasm is twelve miles from Plattsburg and one mile from Keeseville.

AU SABLE RIVER. See MICHIGAN (Its Rivers).

AUSTEN, JANE (1775-1817), an English writer who has had no superior among novelists in ability to fashion an interesting story from the everyday happenings of life in a small village. She was born in a village of Hampshire, the daughter of a clergyman. Her mother was a niece of Theophilus Leigh, for fifty years master of Balliol College, Oxford. No startling events interrupted the placid current of her life, and her novels, as free from sensationalism as the author's own experiences, hold the reader's interest by reason of her clear and flowing style, delicate humor, and admirable gift in story-telling. Sir Walter Scott said of her:



JANE AUSTEN

That young lady had talent for describing the feelings and characters of ordinary life, which is to me the most wonderful I ever met with. The big Bow-Wow strain I can do myself, like any now going; but the exquisite touch, which renders ordinary, commonplace things and characters interesting from the truth of the description and the sentiment, is denied me.

Her Place in Literature. Miss Austen's stories have played an important part in the development of the English novel, and her fame among English writers of fiction is secure. Her novels, numbering only six, are *Sense and Sensibility*, *Pride and Prejudice*, *Mansfield Park*, *Emma*, *Northanger Abbey*, and *Persuasion*.

AUSTERLITZ, *ows' tur litz*, the name of a battle which is conspicuous in history as one of the most masterly, most complete victories ever gained over superior numbers. In 1805 Napoleon, with 70,000 men, defeated the allied Austrian and Russian armies, with 95,000 men. The decisive victory of the French led to the Peace of Pressburg between France and Austria. The village of Austerlitz, now in the Czechoslovakian province of Moravia, ten miles east of Brünn, has a population of about 4,000.

AUSTIN, ALFRED (1835-1913), an English poet who succeeded Alfred Tennyson as poet laureate in 1896. He was born near Leeds. After being graduated from the University of London, he was called to the bar, in 1857, but soon gave up the law for literature. In 1870 he wrote severe criticisms of Tennyson, Browning, and other poets of the time, in an essay entitled *The Poetry of the Period*. His own verse is graceful, but less imaginative than that of the poets he so freely criticized.

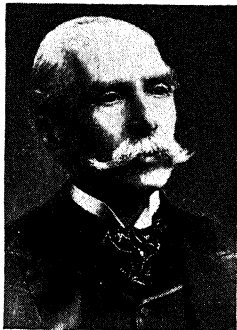


Photo: Brown Bros.
ALFRED AUSTIN

Among his poetical writings are *Songs of England*, *A Tale of True Love and Other Poems* (dedicated to Theodore Roosevelt), *The Door of Humility*, and *Love Poems*. He was also the author of a drama, *Flodden Field*, which was produced in 1903 at His Majesty's Theater, and of several nature essays.

AUSTIN, MINN. See MINNESOTA (back of map).

AUSTIN, STEPHEN FULLER (1793-1836), the founder of Texas, and one of the two men

whom the state has honored by placing their statues in the national Statuary Hall at Washington (the other is Samuel Houston). His father, Moses Austin (1767-1821), obtained from Mexico the first grant of land for an American colony, but he died before the project could be carried out. The son, however, in 1821 established a colony of several hundred families on the Brazos River; the principal settlement was named Austin, in his honor.

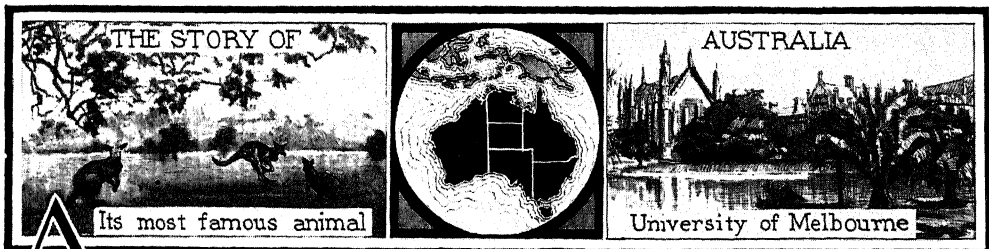
Austin was at first opposed to the movement for Texan independence, but in 1835, when it became clear that no concessions would be made by Mexico in behalf of Americans, he accepted the chief command of the Texan army, but resigned after a few months. He then went to the United States, where he secured money and supplies to aid the Texans. In the next year he was an unwilling candidate for the Presidency of the new republic of Texas, but was defeated by Samuel Houston, in whose Cabinet he was Secretary of State until his death.

Related Subjects. The reader is referred in these volumes to the following articles:

Houston, Samuel	Statuary Hall
Mexican War	Texas (History)

AUSTIN, TEX. See TEXAS (back of map).

AUSTRALASIA, *aws tral a' sha*. See PACIFIC ISLANDS.



AUSTRALIA, *aws tra' li ah*, the smallest of the continents, the only one entirely within the southern hemisphere, and the only one which is an island. In name as well as in location, it is the southland, for the word is taken directly from the Latin, and means *southern*. It is the most detached of the grand divisions, lying between the Indian and the Pacific oceans, far to the southeast of Asia, and as a result, has few similarities to any of the other continents in its physical formations or its animal or plant life. Its area of 2,974,581 square miles is about 600,000 less than that of Europe, and almost equal to that of the United States, without Alaska or its island possessions. It is thus second in size only to Canada among the states of the British Commonwealth of Nations.

With the island of Tasmania to the south, the country since 1901 has been known as the

COMMONWEALTH OF AUSTRALIA; previously, it was but one of the colonial possessions of Great Britain, without unusual powers and prerogatives.

[The article that follows treats of the continental portion of that federation, while Tasmania is considered under its own title. The seven states of the Commonwealth on the mainland, namely, New South Wales, Victoria, Queensland, South Australia, and Western Australia, and North Australia and Central Australia (the two latter were formerly Northern Territory), are given separate treatment in these volumes.]

The People. *The Native Races.* In a consideration of Australia, the term *people* includes two classes as distinct as are the white inhabitants and the Indians of North America. For Australia also has its native races, or *aborigines*, as they are called, the word meaning literally *from the beginning*. These natives have

some characteristics of the negroes, some of the Caucasian peoples, and scholars are inclined to treat them as a race distinct from all others. They are dark in color, have either wavy or straight but never woolly, hair, thick lips, and flat nose. Of medium height, but of inferior muscular, as well as mental and moral, development, by some students of racial characteristics they are placed near the bottom of the scale of humanity. They have no fixed dwellings, living in the summer in the open air and with the coming on of winter sheltering themselves in the rudest of bark dwellings. Most of them wear few clothes, though the southernmost tribes make skin rugs for use in winter.

These lazy, light-hearted savages live by hunting and fishing. They do not cultivate the soil, domesticate animals, or make pottery, but they have fashioned for themselves a number of weapons, in the use of which they are most skilful. Among these are spears, clubs, stone hatchets, and most noted of all, the boomerang (which see).

As to food, they are far from particular. Any animal which they can kill—mammals, birds, lizards, snakes, grubs, and even insects—are eaten, often half raw. Fire is no mystery to them, but is produced by a friction method similar to that shown in the illustration under the article FIRE. The women, obtained for the establishment of families by purchase or abduction, are looked upon as mere slaves, and are often mistreated. All the hard work, all the heavy carrying, is done by them, the men reserving their strength for hunting and inter-tribal wars.

It must be understood that these primitive conditions, which prevailed everywhere at the coming of the white men, now exist only in the wild and unsettled parts of the continent. In the settled districts, a few aborigines remain, for the most part on reservations, and these are sometimes employed by the settlers in light work. They are lazy by nature, however, and soon give up any continuous employment, but they possess, like the North American Indians, an almost incredible ability to follow trails through the woods and the

brush, and are for this reason sometimes of use to the police. It is estimated that there were in Australia about 150,000 of these aborigines at the time the influx of white settlers began, but they have decreased rapidly, and to-day various estimates place their number at about 60,000.

White Inhabitants.

These aborigines are not reckoned in with the total population of the Commonwealth, which is nearly six millions. This includes Tasmania, which has about 215,000. The settlers in Australia have come largely from Great Britain, records showing that about ninety-seven per cent of the population were born either in Australia of British descent, or somewhere in the United Kingdom. Among all the civilized countries of the world, none is more sparsely settled than Australia, which averages but two persons to each square mile. This population is very unevenly

distributed, Victoria having nineteen to the square mile and North and Central Australia one person to each 143 square miles of area. Strangely enough, in an agricultural country, the tendency is strong for the people to congregate in the big cities. Thus, it is estimated that about forty-five per cent of the inhabitants are distributed among the six capital cities and their suburbs, all clean, attractive cities, prosperous and modern. These capitals are Melbourne, Victoria; Sydney, New South Wales; Brisbane, Queensland; Adelaide, South Australia; Perth, West Australia; Hobart, Tasmania. North Australia is still so new that its capital, Port Darwin, has not grown beyond the size of a village.

[For description of the cities, see the articles on the various states of the Commonwealth.]

Australia has room for a hundred million people, and has done much to encourage immigration, not only by making the acquisition of land easy, but even by paying a part or all of the expenses of desirable settlers. In an effort to keep the country a white man's land, barring Asiatics and negroes, and to protect itself against undesirable types, the government recruits its immigrants abroad and provides them with employment on their



Photo: P & A

IN WESTERN AUSTRALIA

In the least known part of the continent, in an area of 750,000 square miles, north and northeast of Perth, there are only 7,500 white people—an average of only one person to 100 square miles. The illustration is that of a native of this section. The markings on his chest are rows of scars, self-inflicted wounds, which are considered decorative.

arrival. In 1925, the government of the Commonwealth put into effect a system of financial aid to emigrants from England.

Physical Features

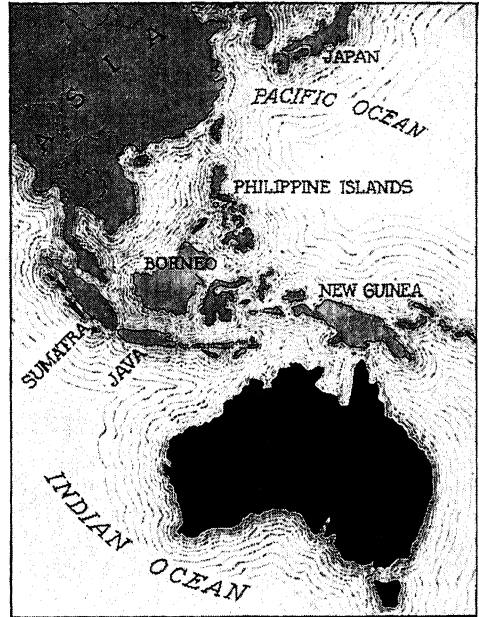
Coast Line and Islands. Like the great continent of Africa to the west, Australia has a comparatively regular coast line. On the south, the shore curves gently inward, forming the Great Australian Bight; on the north, a sharper incurving forms the Gulf of Carpentaria, enclosed within the peninsulas of York and Arnhem Land. There are a few lesser indentations, but nowhere are there such systems of fiords and outstanding capes as prevail in certain parts of North America, Europe, and South America. Its coast line of 11,310 miles is little more than two-thirds that of Norway, if all the indentations of the latter are taken into account.

Of the islands close to the Australian coast, only two, Tasmania and New Guinea, are of considerable importance. Some of the others are but jutting rocks or coral reefs, and many of them are uninhabited. To the north and west lies the great group of the East Indies, containing some of the largest islands in the world, and scientists have found what they regard as convincing evidence that in ages past these islands joined Australia with Asia, which at its nearest point is now 1,800 miles away. The transition nature of the plant and animal life in the East Indies would not alone suffice as evidence, but the shallowness of most of the intervening waters seems to indicate that the islands are merely the highest points of a long-submerged continental land mass. Perhaps even New Zealand, to the southeast, was once connected with Australia geographically.

Barrier Reef. A most interesting feature of the coast of Australia is the Great Barrier Reef, the largest coral formation in the world, which extends for over 1,200 miles along the northeast coast, at places as close as ten miles to the shore, elsewhere as much as 150 miles away. When storms are raging, this great reef may be very dangerous, and many ships have been wrecked upon it, but for the most part it is helpful rather than harmful, as it constitutes a natural breakwater, shielding ships inside it from the storms of the open sea. Pearls and pearl shells are obtained from the reefs, which cover an area of about 100,000 miles.

Surface Features. Australia is a vast land, with greatly diversified physical features. A glance at the accompanying colored map will help to fix in the mind the continent's physical features. The chief mountain system, which does not approach in height those of the other continents, is known as a whole as the Eastern Mountains, though it is given various local

names in different sections of the country, as the Australian Alps, in Victoria, the New England Range, and the Liverpool Range. Beginning near the western boundary of Victoria, this chain of highlands extends nearly parallel with the coast as far as Cape York. On the average, it is about 150 miles in width, and is distant from the coast from fifty to 300 miles. It performs the regular "great divide" function, separating the rivers flowing into the Pacific from those flowing into



LOCATION MAP

Showing location of Australia with respect to the continent of Asia and the great islands to the north.

the interior or into the Indian Ocean. On the whole, this mountain system is little higher than the White Mountains in New England, though its loftiest peak, Mount Kosciusko, in New South Wales, is 7,350 feet in height. These are not steep, craggy mountains, like the great divides of the other continents, but for the most part are rounded summits. Some, however, are lofty enough to be snow-clad for a large part of the year, and certain sheltered ravines can boast eternal snow.

To the west of this mountain country is the great Australian lowland, lowest in the southeast, and rising gradually to the north and west. The eastern part of this lowland region is the basin of the Murray River system; the western, the region of interior drainage, an arid, grassy stretch which has no outlet for its rivers. For a length of 1,000 miles along the southern coast, not even a little stream empties into the sea, and the most of the river beds are dried and cracked mud. This lowland region,

though called the Great Australian Plain, is not a level expanse like the North American prairies, but is broken by low ranges of hills.

The westernmost section, which constitutes over half of the continent, has an average elevation of about 1,000 feet. Much of this region is hot, dry, and barren. Along its seaward edge runs a ridge of high land parallel with the coast. The highest peak in this western plateau region is 5,200 feet in height.

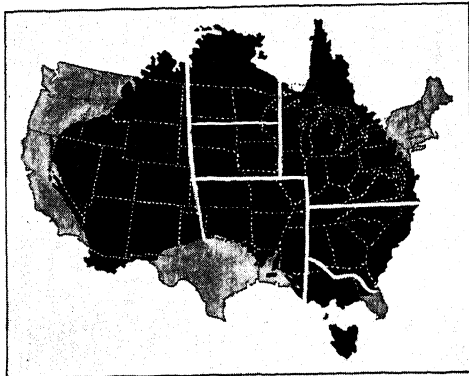
Rivers and Lakes. The river system of Australia is not large, and rivers of any importance are very few. The Murray and its tributaries, the Darling, the Lachlan, and the Murrumbidgee, constitute by far the largest system, and they drain about one-seventh of the continent. Source streams rise on the western slopes of the Eastern Mountains, and even in the dry seasons are fed by the snows of the mountain tops. East of the Great Divide there are a number of short rivers which, considering their length, carry down to the sea a surprisingly large volume of water. In the season of melting snows, sudden overflows are very common. Flowing into the Gulf of Carpentaria and draining the tropical lowland of the north, where the rainfall is heavy, are numerous rivers, while on the west, smaller rivers empty into the Indian Ocean.

Most interesting, though not most important, are the streams of the interior drainage region, of which Cooper Creek is the largest. These can scarcely be said to "empty" into anything, for they seldom carry water, but at such times as streams do flow over their dry courses they discharge into Lake Eyre, the largest lake in Australia. The water of this lake, which has no outlet and lies below sea level, is salty. Eighty miles long and forty miles wide during the rainy season, it undergoes a considerable shrinkage during the dry months, when the region all about it becomes practically a desert. Other lakes without outlet in this same section are Torrens, Gairdner, Blanche, and Frome, named for early explorers.

Climatic Conditions. The northern section of the country is tropical, the central part semi-tropical, and the south temperate. In summer, which corresponds to the winter of the northern hemisphere, the heat is very great throughout much of the continent, for the sun is at that time not only most nearly vertical above it, but is also at its closest approach to the earth. The interior region, removed from the tempering influence of the sea, has an average summer temperature of about 95°. This portion cools down rapidly with the approach of winter, and violent cold winds, commonly known as "southerly bursters," blow from it to the more temperate eastern coast section. The coast regions, indeed, whether eastern or western, have a climate which in the main is delightful and most

healthful, for even during the hot season the air is invigorating.

Rainfall is very unevenly distributed. The Eastern Mountains intercept the rain-bearing



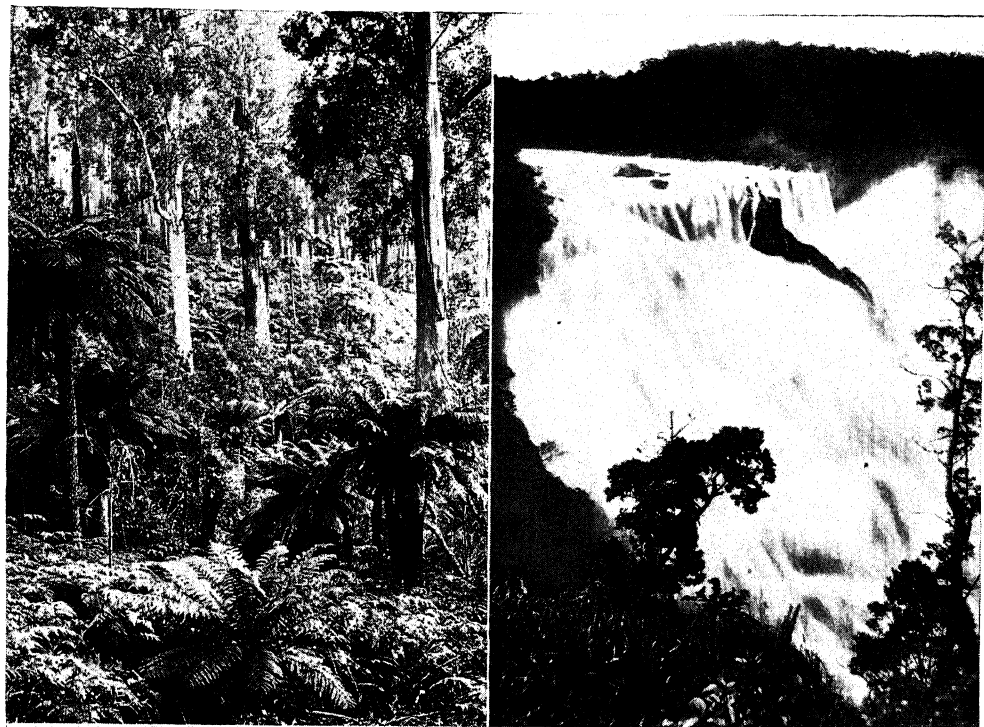
COMPARATIVE AREA
Australia and the United States.

winds of the Pacific, so while plants are parched and dying west of the Great Divide, on the coastal side torrents are falling, and crops are suffering from overflow of rivers. The tropical region to the north is very well watered, the east coast has an abundance of rainfall, and the west coast receives a normal amount; but the vast interior region, stretching south to the Great Australian Bight, has an average of not more than five inches of rainfall in the year.

Plant and Animal Life

Plant Life. So curious and peculiar are the forms of life found in this isolated land that Darwin made here some valuable discoveries in his study of the origin of the species. Some forms of East Indian vegetation have taken root there, but by far the majority show decided peculiarities still flourishing in their primitive forms. In past geologic ages, such plant forms as now exist in Australia covered the earth, but to-day they have practically disappeared elsewhere. Fully 7,000 out of the 12,000 species of plants found in the continent are found nowhere else in the world. The sharp difference in climate and in conditions of moisture, too, have had their influence on the vegetation. Many of the peculiar species show an unmistakable relation to the general dryness, having either scanty foliage, narrow leaves that present little surface for evaporation, or thick, leathery leaves well fitted to retain moisture.

Since not all Australia is arid, however, not all of its plants are of this semi-desert type. In the north and east, a luxuriant tropical vegetation prevails, and it is here, where Australia approaches most closely the East Indies, that certain forms common in the Malay



Photos: Commonwealth Immigration Office

Types of Scenery. Australian tree ferns in a valley in Victoria; Banon Falls, Queensland; evening round-up of the sheep after a day's grazing in one of the fine valleys.

Archipelago appear. Ferns, palms, bamboos, the extraordinary bottle-tree, acacias, and the eucalyptus flourish, the latter attaining its greatest height on the plains of Victoria. This huge tree, which rivals the "big trees" of California in size, is one of the most characteristic Australian types. Of its 150 species, all but three or four are native to this smallest of the continents. Other gum trees also abound, and the acacia, or wattle, is one of the most valuable plants economically, as it yields an excellent bark for tanning. Throughout the forests, gorgeous orchids, brilliantly flowered mistletoes, and other parasitic plants combine with the crimson or golden flowers of certain species of the acacias to present a most striking appearance.

In the interior section and along the southern and parts of the western coast, vegetation is not so luxuriant. Large stretches in the arid region are covered with the characteristic spinifex, or porcupine grass, a hard, coarse, and exceedingly spiny plant, which renders traveling difficult, wounds the feet of horses, and cannot be eaten by any animal. The scrub, or "bush," as it is more commonly called, is made up of various stunted growths of the eucalyptus and myrtle families, crowded so thickly in certain localities as to be actually impenetrable. The gums and volatile oils which these trees contain give to the bush a fragrance as delightful as that of a North American forest where balsam firs abound. It is the bush for which Australia stands in the minds of many people, for almost every man brings from his boyhood memories of *The Bushrangers*, a fascinating story which made that part of the continent very real to him.

Of native fruit trees, Australia has practically none, nor are its food-yielding plants of other kinds much more important. Many European plants have been introduced, however, and they thrive well under cultivation.

Animal Life. As peculiar as the plant life, and even more interesting, are the animals of Australia. Geologists hold that this continent is one of the very oldest parts of the world, and the animal life bears them out in their theory that it must have been separated from the other lands of the eastern hemisphere untold ages ago. Of the many mammals which all the other continents possess—the cats, horses, cattle, lions, bears, elephants—Australia has none that are native. A wild dog known as the *dingo*, several kinds of bats, and a few rodents are the only representatives of the higher animals, all the other mammals belonging to a more primitive class known as *marsupials* (which see). These animals are distinguished by the fact that the young are very immature when born, and are carried by the mother in a pouch until they are able

to shift for themselves. Outside Australia, such pouch animals are found nowhere except in the opossums of North America. The kangaroo, the larger forms of which comprise the biggest animals of Australia, is the best known of these marsupials, but the wombats and the bandicoots are equally interesting and curious.

The marsupials, however, are not the lowest order of mammals that Australia possesses, the echidna and the duckbill, or platypus, ranking farther down in the scale of life. These are, so far as is known, the only mammals in the world that lay eggs.

Of birds, Australia has a large variety, no fewer than 800 distinct species; but these are not so peculiar to the continent as are the mammals. The emu, or Australian ostrich, and the cassowary are the largest of the bird family. Cockatoos, parrakeets, and parrots in great numbers enliven the forests with their brilliant green, yellow, and scarlet plumage, and their incessant chatter. Some birds vie with those of North America in the sweetness of their notes, and eagles and hawks prey upon smaller and weaker forms of life. Peculiar to Australia are the black swan, the honey-sucker, the lyre bird with its curious plumage, and the bower bird, distinct from all other birds by reason of the fantastic structures which it rears for its own delight. Most curious of all is the kookaburra, whose shouts of merriment filling the woods give it the name of *laughing jackass*.

Reptiles and fish are also numerous and varied, and while some of these are most characteristic, the greater number of them bear resemblances to those of other countries.

Resources and Industries

Mineral Resources. Interesting as are its life forms, fertile as are some of its plains, these advantages alone would never have drawn to this isolated island-continent, with its waste of waters on all sides, the hundreds of thousands of colonists who have made it the progressive section of the world that it is to-day. It was gold that made Australia at first important commercially; gold that drew, after its discovery in 1851, streams of adventurers half across the world. Gold-mining, long one of the chief industries, has been declining in its yearly output. Victoria has produced the largest total amount, but of recent years the mines of Western Australia have far surpassed those of any other state. Altogether, the continent has produced since 1852 over \$3,000,000,000 worth of gold.

But gold is not the only important mineral. Silver, which was first mined in 1841, is produced by all the states, New South Wales having by far the largest output. The silver yield, including the value of the lead found

AUSTRALIA AND NEW ZEALAND

CENTRAL AUSTRALIA E 4

Adam Range.....	F 4
Alice Springs (capital), 231.....	E 4
Amadeus, Lake.....	E 4
Crawford Range.....	E 4
Hart Range.....	E 4
Hay River.....	F 4
James Range.....	E 4
Lake Nash Station, 112.....	F 4
Liebig, Mount.....	E 4
MacDonnell Range.....	E 4
Morphett, Mount.....	F 4
Murchison Range.....	E 3
Musgrave Range.....	E 3
Reynold Range.....	E 4
Sandover River.....	F 4
Stanley, Mount.....	E 4
FEDERAL DISTRICT.....	H 7
Canberra, 2,563.....	H 7

NEW SOUTH WALES G 6

Albury, 7,746.....	H 7
Armidale, 5,309.....	J 6
Ballina, 2,768.....	J 5
Bathurst, 9,442.....	H 6
Bingara, 1,014.....	J 5
Blayney, 1,342.....	H 6
Blue Mountains.....	H 6
Bombala, 978.....	H 7
Botany Bay.....	J 6
Bourke, 1,429.....	H 6
Brewarrina, 665.....	H 5
Broken Hill, 26,337.....	G 6
Byron, Cape.....	J 5
Casino, 3,453.....	J 5
Cobar, 1,438.....	H 6
Cooma, 1,835.....	H 7
Coomamble, 2,212.....	H 6
Corowa, 2,389.....	H 7
Darling River.....	G 6
Deniliquin, 2,661.....	H 7
Dubbo, 5,031.....	H 6
Eden.....	H 7
Exmouth, Mount.....	H 6
Fernmount.....	J 6
Forbes, 4,379.....	H 6
Glen Innes, 4,976.....	J 5
Goulburn, 12,667.....	H 6
Grafton, 4,592.....	J 5
Grenfell, 1,192.....	H 6
Gunnedah, 2,665.....	H 6
Hay, 2,569.....	G 6
Howe, Cape.....	J 7
Inverell, 4,366.....	J 5
Kempsey, 3,609.....	J 6
Kiama, 1,962.....	J 6
Kosciusko, Mount.....	H 7
Lachlan River.....	H 6
Lithgow, 13,276.....	J 6
Liverpool, 6,295.....	J 6
Lyell Mount.....	G 6
Macintyre River.....	H 5
Macquarie River.....	H 6
Maitland, 12,004.....	J 6
Moama, 711.....	H 7
Molong, 1,504.....	H 6
Moruya.....	J 7
Mudgee, 3,168.....	H 6
Murray River.....	G 6
Murrumbidgee River.....	G 6
Murrumbidgee, 2,960.....	H 6
Murrurundi, 1,301.....	H 6
Namoi River.....	H 6
Narrabri, 2,354.....	J 6
Newcastle, 14,555.....	J 6
New England Range.....	J 5
Nymagee.....	H 6
Nyngan, 1,374.....	H 6
Orange, 7,399.....	H 6
Paroo River.....	G 5
Parramatta, 14,602.....	J 6
Peopeloe, Lake.....	G 6
Port Macquarie, 1,563.....	J 6
Queanbeyan, 1,824.....	H 7
Richmond, 2,010.....	J 6
Scone, 1,802.....	J 6
Sea View, Mount.....	J 6
Singleton, 3,269.....	J 6
Sugar Loaf Point.....	J 6
Sydney (capital), 152,626.....	H 6
Temora, 3,048.....	H 6

Tenterfield, 2,491.....	J 5
Tumut, 1,638.....	H 7
Wagga Wagga, 7,676.....	H 7
Warrego River.....	H 5
Wellington, 3,929.....	H 6
Wentworth, 817.....	G 6
Wickham, 12,149.....	J 6
Wollongong, 6,707.....	J 6
Wyalong, 786.....	H 6
Yass, 2,502.....	H 6

NORTH AUSTRALIA E 3

Alexander, Mount.....	F 2
Anson Bay.....	D 2
Anthony Lagoon Station, 66.....	F 3
Apsley Strait.....	D 2
Arafura Sea.....	E 1
Arnhem, Cape.....	F 2
Arnhem Land.....	E 2
Bathurst Island.....	D 2
Blue Mud Bay.....	F 2
Carpentaria, Gulf of.....	F 2
Castlereagh Bay.....	E 2
Coast Range.....	F 3
Coburg Peninsula.....	E 2
Creswell Creek.....	F 3
Croker Island.....	E 2
Daly River.....	E 2
Darwin (capital), 1,398.....	E 2
Darwin, Port.....	E 2
Dundas Strait.....	E 2
Elcho Island.....	F 2
Ford, Cape.....	D 2
Goulburn Islands.....	E 2
Grey, Cape.....	F 2
Groote Eylandt (island).....	F 2
Limmen Bight.....	F 2
McArthur River.....	F 3
Melville Bay.....	F 2
Melville Island.....	E 2
Peron Islands.....	D 2
Pine Creek, 354.....	E 2
Polygonum Swamp.....	F 3
Queens Channel.....	D 2
Roper River.....	E 2
Sandy Desert.....	E 3
Sea Range.....	E 2
Sir Edward Pellew Group (islands).....	F 3
Sylvester, Lake.....	F 3
Tennants Creek.....	E 3
Vanderlin Island.....	F 3
Van Diemen, Cape.....	E 2
Van Diemen Gulf.....	E 2
Victoria River.....	E 3
Wessel, Cape.....	F 2
Wessel Islands.....	F 2
Whittington Range.....	E 3
Woods Lake.....	E 3
Young, Mount.....	F 3

QUEENSLAND G 4

Archer River.....	G 2
Avadale.....	G 5
Barcoo River.....	G 4
Belyando River.....	H 4
Bentinck Island.....	G 3
Birdsville.....	F 5
Blackall, 1,426.....	H 4
Bowen, 2,115.....	H 4
Bowling Green, Cape.....	H 3
Brisbane (capital), 79,808.....	J 5
Broad Sound.....	H 4
Bulloo River.....	G 5
Bundaberg, 9,276.....	J 4
Burdekin River.....	H 3
Burketown.....	F 3
Cairns, 7,455.....	H 3
Capricorn Group (islands).....	J 4
Cardwell.....	H 3
Carpentaria, Gulf of.....	F 2
Charleville, 2,335.....	H 5
Charters Towers, 9,499.....	H 4
Cheviot Range.....	G 5
Clermont, 1,259.....	H 4
Cloncurry River.....	C 3
Cooktown, 881.....	H 3
Coral Sea.....	J 2
Coringa Islands.....	H 3
Cornish Creek.....	H 4
Croydon Goldfield.....	G 3

Culgoa River.....	H 5
Cumberland Isles.....	H 4
Curtis Island.....	J 4
Dalrymple, Mount.....	H 4
Darling Downs.....	J 5
Dawson River.....	H 4
Denison, Port.....	H 3
Direction, Cape.....	G 2
Duyfhen Point.....	G 2
Endeavour Strait.....	G 2
Etheridge Goldfield.....	G 3
Eton.....	H 4
Eyre Creek.....	F 5
Fitzroy River.....	H 4
Flattery Cape.....	H 2
Flinders Reef.....	H 3
Flinders River.....	G 4
Geraldton.....	H 3
Gilbert River.....	G 3
Gladstone, 2,128.....	J 4
Grampian Hills.....	G 4
Great Barrier Reef.....	H 3
Great Dividing Range.....	H 4
Great Sandy Island.....	J 5
Gregory Range.....	G 3
Gregory River.....	F 3
Gregory South (district).....	G 5
Grenville, Cape.....	G 2
Grey Range.....	G 5
Gympie, 6,519.....	J 5
Halifax Bay.....	H 3
Hervy Bay.....	J 4
Hetherington, Mount.....	G 5
Hinchinbrook Island.....	H 3
Holmes Reefs.....	H 3
Horrible, Mount.....	H 5
Hughenden, 1,881.....	G 4
Hutton, Mount.....	H 5
Ipswich, 20,526.....	J 5
Keerweer, Cape.....	G 2
Keppel Bay.....	J 4
Kirby Range.....	G 4
Leichhardt (district).....	H 4
Leichhardt River.....	G 3
Lindsay, Mount.....	J 5
Machattie Lake.....	G 4
Macintyre River.....	H 5
Mackay, 6,320.....	H 4
Mackenzie River.....	H 4
MacKillop, Lake (or Yamma Yamma).....	G 5
Maryborough, 10,635.....	J 5
McIlwraith Range.....	G 2
Melville, Cape.....	H 2
Mirani.....	H 4
Mitchell River.....	G 3
Moreton.....	J 5
Moreton Island.....	J 5
Mornington Island.....	F 3
Mueller Range.....	G 4
Norman River.....	G 3
Northumberland Isles.....	J 4
Pera Head.....	G 2
Perry, Mount.....	J 5
Peter Botte (mountain).....	H 3
Philippi Lake.....	F 4
Port Clinton.....	J 4
Port Curtis (district).....	J 4
Prince of Wales Island.....	G 2
Princess Charlotte Bay.....	G 2
Rockhampton, 24,182.....	J 4
Roma, 3,247.....	H 5
Sandy Cape.....	J 4
Selwyn Range.....	G 4
Senex, Mount.....	G 4
Sidmouth, Cape.....	G 2
Somerset.....	G 2
Southport, 3,543.....	J 5
Staaten River.....	G 3
Stradbroke Island.....	J 5
Sutor River.....	H 4
Swain Reefs.....	J 4
Thomson River.....	G 4
Thursday Island, 1,079.....	J 5
Toowoomba, 20,702.....	J 5
Torres Strait.....	G 2
Townsville, 21,348.....	H 3
Trinity Bay.....	H 3
Warrego Range.....	G 4
Warwick, 6,095.....	J 5
Wellesley Islands.....	F 3
Winton.....	G 4

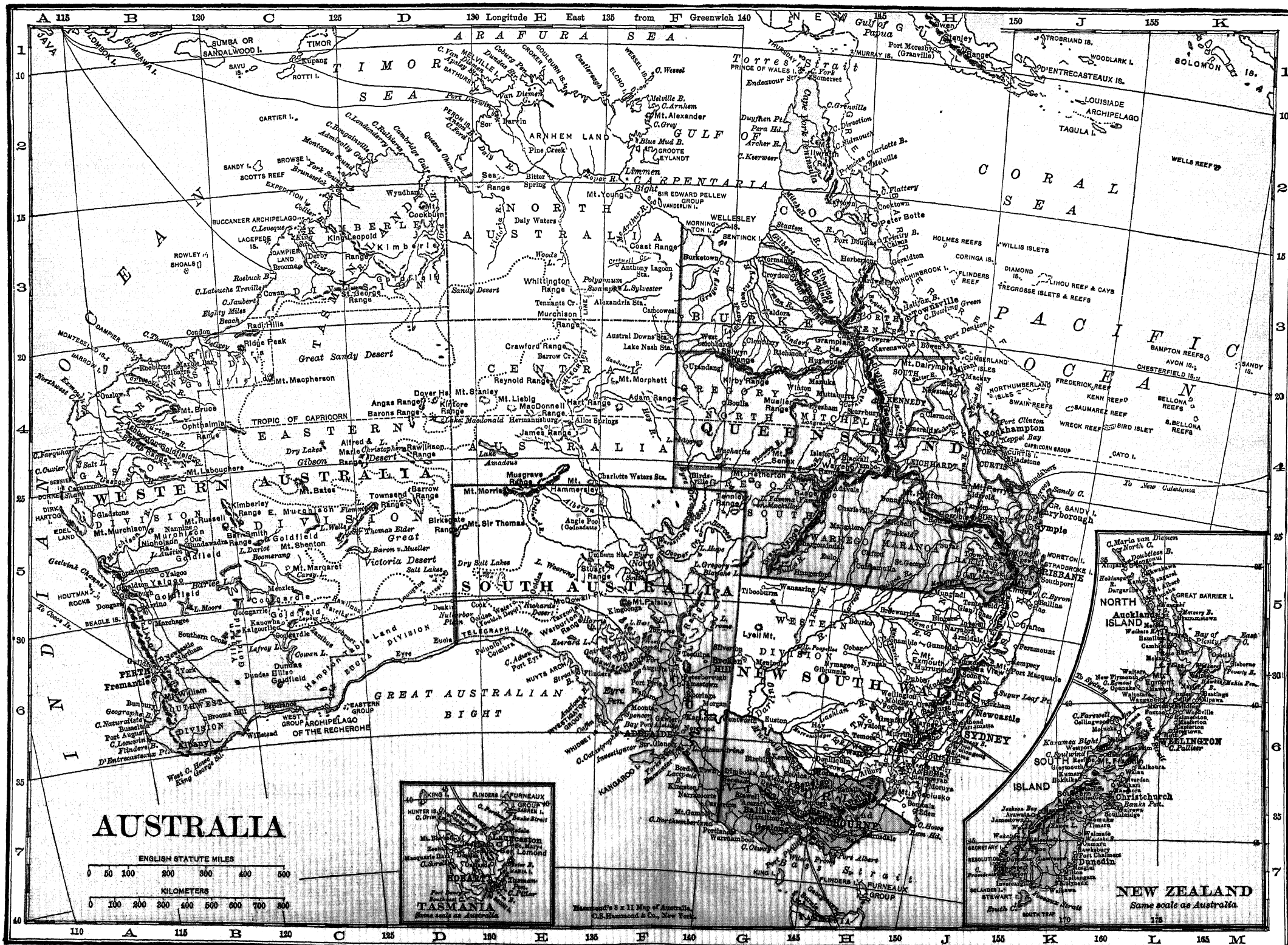
Yamma Yamma, Lake (or MacKillop).....	G 5
York, Cape.....	G 2
York Peninsula, Cape.....	G 2

SOUTH AUSTRALIA E 5

Adelaide (capital), 39,562.....	F 6
Adieu, Cape.....	E 6
Alberga River.....	E 5
Alexandrina, Lake.....	G 7
Anxious Bay.....	E 6
Barcoo Creek (or Coopers).....	F 5
Birksgate Range.....	D 5
Blanche Lake.....	F 5
Catastrophe, Cape.....	F 7
Coffin Bay.....	F 6
Coimbra.....	E 6
Coopers Creek (or Barcoo).....	F 5
Dry Salt Lakes.....	E 5
Encounter Bay.....	F 7
Everard Lake.....	E 6
Eyre, Lake (North).....	F 5
Eyre, Lake (South).....	F 5
Eyre Peninsula.....	F 6
Ferdinand River.....	E 5
Flinders.....	E 6
Flinders Range.....	F 6
Frome, Lake.....	G 6
Gairdner Lake.....	F 6
Gawler, 1,775.....	F 6
Gawler Range.....	F 6
Glenelg, 7,998.....	F 7
Great Australian Bight.....	E 6
Gregory, Lake.....	F 5
Hammersley, Mount.....	E 5
Harris Lake.....	E 5
Hart, Lake.....	F 6
Hope, Lake.....	F 5
Investigator Group.....	E 6
Investigator Strait.....	F 7
Island Lagoon.....	F 6
Jamestown, 1,361.....	F 6
Kapunda, 1,564.....	F 6
Kangaroo Island.....	F 7
Kingston.....	F 7
Lacepede Bay.....	F 7
McDowall Peak.....	E 6
Moonta, 1,335.....	F 6
Morris, Mount.....	E 5
Mount Gambier, 3,968.....	G 7
Musgrave Range.....	E 5
Northumberland, Cape.....	F 7
Norwood.....	F 6
Nullarbor Plain.....	D 6
Nuyts Archipelago.....	E 6
Paisley, Mount.....	F 6
Pelumbi.....	E 6
Pernatti Lagoon.....	F 6
Peterborough, 2,189.....	F 6
Port Adelaide, 30,116.....	F 6
Port Augusta, 1,764.....	F 6
Port Pirie, 9,808.....	F 6
Richards Desert.....	E 6
Sir Thomas, Mount.....	E 5
Spencer Bay.....	F 6
Streaky Bay.....	E 6
Stuart Range.....	F 5
Tenniel Range.....	G 5
Torrens, Lake.....	F 6
Wallaroo, 3,308.....	F 6
Warburton Range.....	E 6
Warburton River.....	F 5
Whidbey Islands.....	F 7
Woorong, Lake.....	E 5
York Peninsula, 3,195.....	F 7

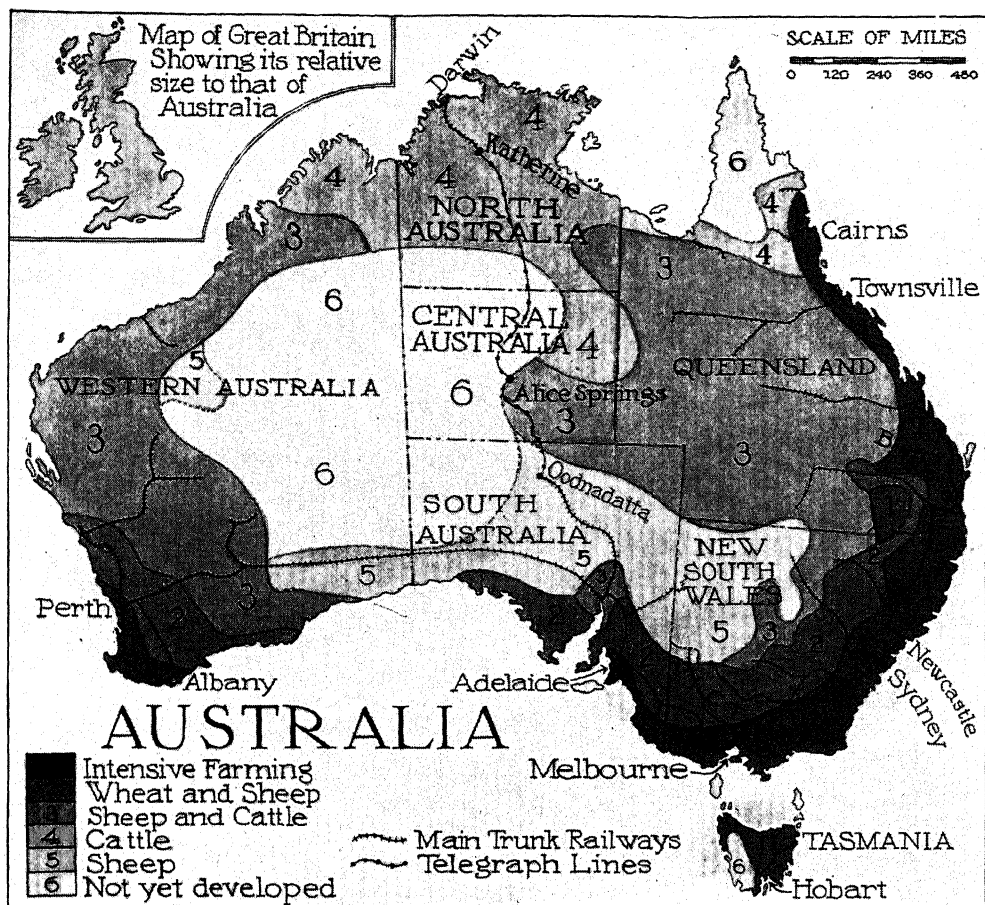
WESTERN AUSTRALIA B 5

Admiralty Gulf.....	D 2
Albany, 3,980.....	B 6
Alfred and Marie Range.....	C 4
Angas Range.....	D 4
Archipelago of the Recherche.....	C 6
Ashburton Goldfield.....	B 4
Ashburton River.....	B 4
Austin, Lake.....	B 5
Barlee Lake.....	B 5
Barlee Range.....	B 4
Barons Range.....	D 4
Baron Von Mueller, Lake D.....	D 5



AUSTRALIA AND NEW ZEALAND *Continued*

Barrow Island.....	A 4	Lefroy Lake.....	C 6	Oyster Bay.....	E 7	Hauraki Gulf.....	M 5
Barrow Range.....	D 5	Leveque, Cape.....	C 3	Pillar, Cape.....	E 7	Hawea Lake.....	L 6
Barr Smith Range.....	C 5	Londonderry, Cape.....	D 2	Portland, Cape.....	E 7	Hawera, 4,149.....	L 5
Bates, Mount.....	C 5	Macdonald, Lake.....	E 4	Scottsdale, 2,950.....	E 7	Hawkes Bay.....	M 5
Beagle Islands.....	A 5	Macpherson, Mount.....	C 4	Sorell, Cape.....	D 7	Hawkesbury.....	L 7
Bernier Island.....	A 4	Margaret, Mount.....	C 5	Southwest Cape.....	D 7	Hokianga River.....	L 5
Boomerang Lake.....	C 5	Montague Sound.....	C 2	Storm Bay.....	E 7	Hokitika, 2,215.....	L 6
Bougainville, Cape.....	D 2	Montebello Islands.....	A 3	Tasman Peninsula.....	E 7	Invercargill, 17,036.....	K 7
Browse Island.....	C 2	Moore, Lake.....	B 5	Ulverstone, 2,246.....	D 7	Jackson Bay.....	K 6
Bruce, Mount.....	B 4	Murchison Goldfield.....	B 5	Zeehan, 3,124.....	D 7	Kaikoura, 473.....	L 6
Brunswick Bay.....	C 2	Murchison, Mount.....	B 5			Kaitangata, 1,721.....	L 7
Buccaneer Archipelago.....	C 3	Murchison River.....	B 5			Karamea Bight.....	L 6
Bunbury, 4,478.....	B 6	Nannine.....	B 5	VICTORIA	G 7	Kingston, 63.....	K 7
Busselton, 610.....	B 6	Naretha.....	C 6	Albert, Port.....	H 7	Kumara, 507.....	L 6
Cambridge Gulf.....	D 2	Naturaliste, Cape.....	B 6	Ararat, 4,657.....	G 7	Lawrence, 703.....	K 7
Carey Lake.....	C 5	Newcastle.....	B 6	Australian Alps.....	H 7	Mahia Peninsula.....	M 5
Carnarvon, 954.....	A 4	Nicholson Range.....	B 5	Ballarat, 34,672.....	G 7	Maria van Diemen, Cape.....	L 4
Cartier Island.....	C 2	Northam, 3,583.....	B 6	Bass Strait.....	H 7	Marton, 2,602.....	M 6
Christopher, Lake.....	D 4	Northwest Cape.....	A 4	Bendigo (Sandhurst), 25,693.....	G 7	Masterston, 7,820.....	M 6
Cockburn, Mount.....	C 3	Nullarbor Plain.....	D 6	Dunolly, 853.....	G 7	Mercury Bay.....	M 5
Collier Bay.....	C 3	Ophthalma Range.....	B 4	Eaglehawk, 4,719.....	G 7	Milton, 1,363.....	L 7
Coolgardie, 701.....	C 6	Or River.....	D 3	Echuca, 3,745.....	G 7	Mokau, 173.....	L 5
Coolgardie Goldfield.....	C 5	Perth (capital), 67,134.....	B 6	Geelong, 14,818.....	G 7	Mosgiel, 1,762.....	L 7
Cowan Lake.....	C 6	Pilbarra Goldfield.....	B 4	Great Dividing Range.....	G 7	Motueka, 1,484.....	L 6
Cuivier, Cape.....	A 4	Port Augusta.....	B 6	Hamilton, 5,098.....	G 7	Napier, 14,346.....	M 5
Dampier Archipelago.....	B 3	Radi Hills.....	C 3	Horsham, 3,788.....	G 7	Nelson, 9,285.....	L 6
Dampier Land.....	C 3	Rawlinson Range.....	C 4	Maryborough, 4,747.....	G 7	New Plymouth, 11,395.....	L 5
Darling Range.....	C 5	Ridge Peak.....	C 4	Melbourne (capital), 150,148.....	H 7	North Cape.....	L 4
Darlot, Lake.....	C 6	Roebuck Bay.....	C 3	Murray River.....	G 6	Oamaru, 5,729.....	L 7
DeGrey River.....	B 4	Rowley Shoals.....	B 3	Otway, Cape.....	G 7	Omaha.....	L 5
D'Entrecasteaux Point.....	B 6	Ruhiheres, Cape.....	D 2	Phillip, Port.....	G 7	Opotiki, 1,140.....	M 5
Dirk Hartog Island.....	A 5	Russell, Mount.....	B 5	Portland, 2,554.....	G 7	Opua, 240.....	L 5
Dorre Island.....	A 5	Saint George Range.....	D 3	Ram Head.....	J 7	Palliser, Cape.....	M 6
Dover Hills.....	D 4	Salt Lake.....	A 4	Sale, 3,768.....	H 7	Palmerston, 16,457.....	M 6
Dry Lakes.....	C 4	Salt Lakes.....	D 5	Sandhurst (Bendigo), 25,693.....	G 7	Plenty, Bay of.....	M 5
Dundas Goldfield.....	C 6	Sandy Island.....	C 2	Stawell, 4,411.....	G 7	Port Albert, 79.....	L 5
Eastern Group (islands).....	C 6	Scotts Reef.....	C 2	Warrnambool, 7,739.....	G 7	Port Chalmers, 2,594.....	L 7
East Murchison Gold- field.....	C 5	Sharks Bay.....	A 5	Wilson Promontory.....	H 7	Poverty Bay.....	M 5
Edel Land.....	A 5	Shenton, Mount.....	C 5			Providence Cape.....	K 7
Eighty Miles Beach.....	C 3	Sir Thomas Elder, Lake.....	D 5			Pukaki Lake.....	K 6
Esperance.....	C 6	Thouin, Cape.....	B 4			Rangiora, 2,003.....	L 6
Eucla.....	D 6	Timor Sea.....	D 2	NEW ZEALAND	M 7	Reefton, 1,603.....	L 6
Exmouth Gulf.....	A 4	Townsend Range.....	D 5	Ahipara, 41.....	L 5	Resolution Island.....	K 7
Expedition Island.....	C 2	Wells, Lake.....	C 5	Alexandra, 687.....	K 6	Riverton, 847.....	K 7
Eyre.....	D 6	West Cape Howe (town).....	B 7	Ashburton, 4,825.....	L 6	Rollestone, 176.....	L 6
Farquhar, Cape.....	A 4	West Group (islands).....	C 6	Auckland, 81,712.....	L 5	Roto Rua, 3,872.....	M 5
Fitzroy River.....	C 3	William, Mount.....	B 6	Banks Peninsula.....	L 6	Secretary Island.....	K 7
Flemming, Lake.....	D 5	Willstead.....	B 6	Blenheim, 4,345.....	L 6	Solander Island.....	K 7
Flinders Bay.....	B 6	Yalgoo Goldfield.....	B 5	Buller River.....	L 6	South Cape.....	K 7
Fortescue River.....	B 4	Yilgarn Goldfield.....	B 6	Cambridge, 2,065.....	L 5	Southern Alps.....	L 6
Fremantle, 25,526.....	B 6	York, 1,510.....	B 6	Carterton, 1,670.....	M 6	South Trap.....	K 7
Gascoyne River.....	B 4	York Sound.....	C 2	Christchurch, 67,291.....	L 6	Stewart Island.....	K 7
Geelyvink Channel.....	A 5			Collingwood, 200.....	L 6	Tasman Bay.....	L 6
Geographe Bay.....	B 6	TASMANIA	D 7	Cook Strait.....	L 6	Taupo Lake.....	M 5
Geraldton, 4,176.....	A 5	Banks Strait.....	E 7	Culverden, 252.....	L 6	Tauranga, 2,241.....	M 5
Gibsons Desert.....	C 6	Barren Island.....	E 7	Dargaville, 2,054.....	L 5	Temuka, 1,753.....	L 6
Great Australian Bight.....	E 6	Ben Lomond.....	E 7	Doubtless Bay.....	L 4	Timaru, 14,058.....	L 6
Great Sandy Desert.....	C 4	Bischoff, Mount.....	D 7	Dunedin, 58,074.....	L 7	Waikare Lake.....	M 5
Great Victoria Desert.....	D 5	Bruni Island.....	E 7	East Cape.....	M 5	Waikari, 520.....	L 6
Guildford, 1,877.....	B 6	Burnie, 2,897.....	H 7	Egmont Cape.....	L 5	Waikato River.....	L 5
Hampton Table Land.....	C 6	Davey, Port.....	D 7	Egmont, Mount.....	L 5	Waikawa, 65.....	K 7
Houtman Rocks.....	A 5	Devonport, 6,180.....	D 7	Farewell, Cape.....	L 6	Waimate, 2,100.....	L 6
Jaubert, Cape.....	C 3	Flinders Island, 905.....	E 7	Feilding, 4,510.....	M 6	Waipawa, 1,119.....	M 5
Kalgoolie, 7,898.....	C 6	Furneaux Group (islands).....	E 7	Foulwind, Cape.....	L 6	Wairoa, 1,921.....	M 5
Kimberley Goldfield.....	D 3	Georgetown, 1,038.....	D 7	Foveaux Strait.....	K 7	Waitaki River.....	L 6
Kimberley Range.....	C 5	Grim, Cape.....	D 7	Foxton, 1,686.....	M 6	Waitara, 1,566.....	L 5
King George Sound.....	B 7	Hobart (capital), 43,615.....	D 7	Franklin, Mount.....	L 6	Waitotara, 289.....	L 5
King Leopold Range.....	D 3	Hunter Islands.....	D 7	Cisborne, 10,931.....	M 5	Wakatipu Lake.....	K 6
King Sound.....	C 3	King Island, 1,041.....	G 7	Golden Bay.....	L 6	Wanaka Lake.....	K 6
Kintore Range.....	D 4	Launceston, 24,318.....	E 7	Great Barrier Island.....	M 5	Wanganui, 16,490.....	L 5
Labouchere, Mount.....	B 3	Longford, 3,894.....	D 7	Greymouth, 4,986.....	L 6	Wellington (capital), 88,920.....	L 6
Lacepede Islands.....	C 3	Macquarie Harbor.....	D 7	Hamilton, 11,441.....	L 5	Westport, 3,802.....	L 6
Lapege Lake.....	C 3	Maria Island.....	E 7	Hampden, 334.....	L 6	Whitecliffs, 109.....	L 6
Latouche Treville, Cape.....	C 3	Oatlands, 3,086.....	D 7	Hastings, 9,115.....	M 5	Woodville, 1,150.....	M 6
Leeuwin, Cape.....	B 6						



DEVELOPMENT OF THE CONTINENT

with it, rivals the gold production, while copper, tin, and coal have steadily increased. Queensland ranks first among copper-producing states, and New South Wales is by far the largest producer of coal, its yield being more than ten times that of any other state. Zinc, iron, lead, and various precious stones in small quantities are also found, and it may thus be seen that Australia is one of the world's richest mining regions.

Agriculture. Not all the people of Australia are miners or seekers after gold, for agriculture in its various forms has attained great importance. In the vast interior arid region and along much of the western coast, little can be grown, for while the soil and climate are excellently adapted to any of the warm-temperate or semi-tropical crops, the moisture is too scanty for production. No great rivers suggest the possibility of extensive irrigation schemes, but there frequently exists below the surface a considerable supply of water, which is made available by means of artesian

wells. Hundreds of these dot the country, particularly in Queensland and New South Wales, and are helping to increase the proportion of cultivated land. Even so, however, the area devoted to crops is comparatively small—only about 16,500,000 acres in the whole Commonwealth, chiefly in the well-watered eastern section, on both sides of the Great Divide.

Wheat is grown and exported in enormous quantities; corn, oats, barley, potatoes, and hay are produced in sufficient quantities to supply home demand. In the tropical regions of Queensland, cotton, sugar cane, bananas, and pineapples are cultivated, while in the south and southeast grow such Mediterranean fruits as the grape, olive, mulberry, apricot, and citrus fruits. Apples are abundant in Tasmania. The forests yield valuable hardwoods.

Irrigation development was started in the state of Victoria under the supervision of Americans, and having proved successful, was

extended. In New South Wales there has been completed the Burrinjuck dam, on the Murrumbidgee River, which, together with other projects under construction in the Murray Valley, will irrigate 1,500,000 acres of land.

Grazing. To the present time, Australia has been preëminently a stock-raising country, but it is predicted that the transformation of Australia from a grazing to an agricultural country will parallel that of the Western United States. Wherever there is sufficient moisture for grass—and grass will grow where no crops can be produced—there are found great flocks of sheep. More valuable even than gold these sheep have been; they produce the finest wool in the world, and Australia has greater numbers than any other country. Naturally, then, it is the chief of all wool-producing countries, the yield in some years often being twice that of Argentina or the United States. Of recent years, too, mutton has been exported, though formerly all the sheep were grown for their wool. Careful attention is given to breeding.

Cattle also thrive on the excellent Australian grazing lands, the number averaging about 10,000,000. Since the discovery of successful cold-storage methods, much beef has been exported, and butter is also sent to Asia and to Europe.

More detailed information as to agricultural products, as well as commerce, may be gained from the articles on the separate states.]

Manufactures. While Australia remains predominantly a wheat and sheep-raising country, the increasing output of the coal and iron mines of the southeastern section has given recent impetus to manufacturing. This industry is devoted chiefly to the resources at hand, and includes the production of sugar, flour, wine, jam, cheese, butter, condensed milk, clothing, textiles, machinery, and tanning, meat-packing, and metal-working.

Communication and Commerce. Since the rivers of Australia are few, railways must run everywhere, if there is to be intercommunication and development, but much of the country beyond the coast regions is so sparsely settled that it can afford no proper return on capital invested in railroads. Government construction has thus been made necessary, and

the country now has a total of over 27,600 miles. In most cases, it is the states and not the Commonwealth which have built these lines, but the Federal government is responsible for the transcontinental line joining the railways of South Australia with those of

Western Australia. There is a line from the northern limit of South Australia to Pine Creek in the new North Australia, the terminus of the road from Port Darwin. Electrification of railways is a recent and profitable project in metropolitan areas. Late in 1928 air-mail service was inaugurated between London and Sydney. Planes

fly only in daylight, and the trip requires twelve days.

Difficulties in Railroad Transportation. While in most of the world standard-gauge railroads are the rule, this is not true in Australia. Long hauls cannot be made without transfer of goods from one car to another. The width of the track throughout the continent varies from 3 feet 6 inches to 5 feet 3 inches. Following are examples of this variation:

	MILES	GAUGE
Freemantle to Kalgoorlie....	387	3 ft. 6 in.
Kalgoorlie to Port Augusta....	1051	4 ft. 8½ in.
Port Augusta to Terowie....	120	3 ft. 6 in.
Terowie to Albury.....	814	5 ft. 3 in.
Albury to Wallangara.....	893	4 ft. 8½ in.
Wallangara to Brisbane.....	223	3 ft. 6 in.

A Strange Right of Way. An item of interest to foreigners is that in crossing what is known as the Nullabor Plain—so named because it is treeless—the railroad has not a curve for more than 300 miles. This is the longest straight line in the world. Another point of interest is that in its length of 1,051 miles—from Kalgoorlie to Port Augusta—it does not cross a stream of water.

The Commonwealth government owns and operates the telegraph and telephone systems. Telegraph lines extend across the continent from north to south and from east to west, and connect all the important towns. In all, there are about 50,000 miles of line. This remote continent has wireless telegraphy and air-mail service, and it enjoys cable communication with all the countries of the world.

As the world's greatest producer of raw material in proportion to population, Australia has established a very large foreign commerce.

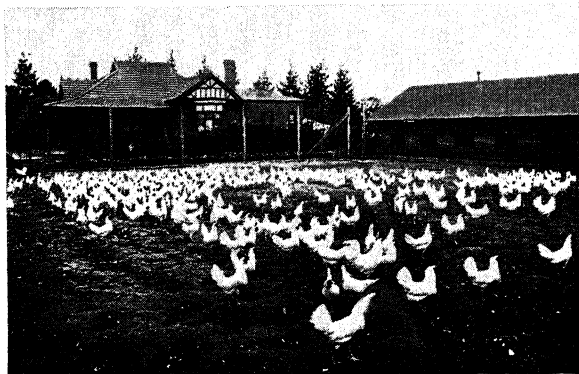
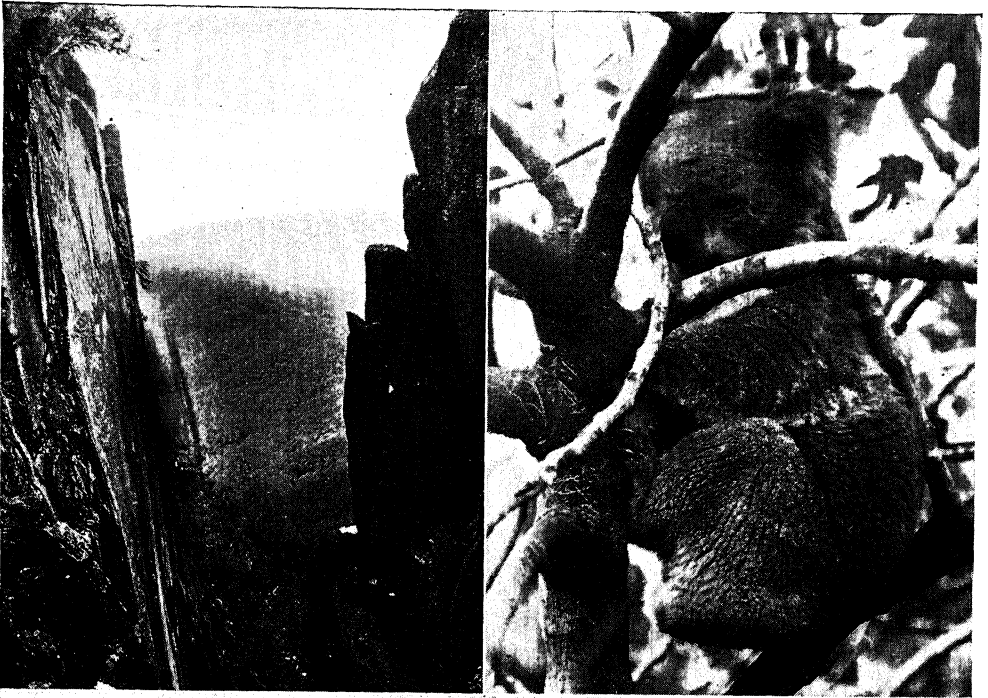


Photo: Commonwealth Immigration Office

A POULTRY FARM



Photos: Commonwealth Immigration Office

Common Scenes. A gorge in the Australian highlands; the native Australian bear, found nowhere else in the world; camp of teamsters at night, after one of many days on a long trail to market.

Millions of tons of merchandise enter and leave its ports each year, by far the larger proportion coming from or going to British possessions. The chief exports are wool, hides, wheat, butter, meat, and gold, while the imports, sometimes exceeding them in value, include manufactured goods of all kinds.

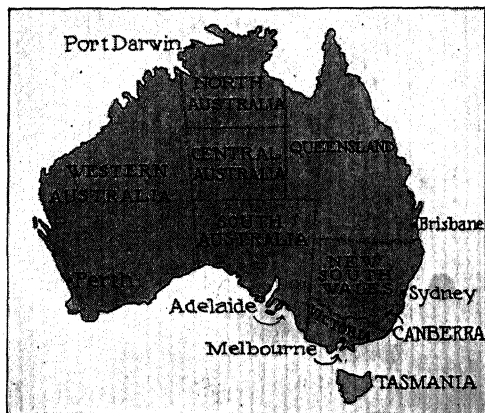
Education. In Australia there are no city superintendents of schools, nor are there school boards. A director of education in each of the states of the Commonwealth holds his post for life; politics has no place in the school system. Next below the director in authority is a senior inspector. District inspectors, appointed by the public-service commissioner, who makes all public appointments on the basis of merit, are the administrators of geographical school groups within the state. To them the head masters, corresponding to principals of schools in American towns, are responsible.

The country has a lower percentage of illiteracy among the white population than either the United States or Canada. The educational system of each state extends from the primary school upward through the university, located in every instance in the state capital.

In Western Australia, the government in 1927 provided for instruction of children by correspondence, especially designed for those beyond the reach of schoolroom instruction. A senior inspector is in charge of this work.

Government and History

Government. The Commonwealth of Australia is a federation of states which was formed in January, 1901. It is a member of the British Commonwealth of Nations, and since 1926 is one of the six British states which enjoys



CANBERRA, THE NEW CAPITAL

practical independence. Its Constitution resembles closely that of the United States, in that it expressly declares that all powers not

specifically allowed to the central government belong to the states. In many ways, however, it differs from any Constitution previously prepared, and some students of politics regard it as a step in advance of any other. Thus, the Federal government takes charge of banking and insurance, marriage, divorce, parental rights and guardianship, immigration and emigration, telegraphs, telephones, and in times of danger, of the railways. All these functions are in addition to those commonly delegated to a national government. Women have full suffrage, on equal terms with men. A distinctive feature of Australian government is the fact that all citizens who are eligible are required by law to vote.

Some of the other important governmental policies of Australia have been expressed in laws providing for old age and invalid pensions; a maternity bonus whereby a mother can receive a sum equal to \$24 on the birth of each child; eight-hour work day; governmental loans to farmers for improving land; the building of workmen's cottages, which are then rented or sold on very easy terms; and governmental ownership or control of all public utilities.

Executive Department. The Governor-General, before 1926 the real head of the state and local representative of the Crown, is now an accredited ambassador of the king. The real head of the government is the Premier, or Prime Minister, who rules in connection with his Cabinet. The Cabinet members, besides himself, are the heads of the departments of External Affairs, Home Affairs, Finance, Trade and Customs, Defense, Works and Railways, Markets and Migration, besides an Attorney-General and a Postmaster-General. These officials are members of the Parliament, or must secure election to it within three months after their appointment.

Legislative Department. The Federal Parliament consists of two houses, a Senate and a House of Representatives; the British sovereign is also a nominal member, represented by the Governor-General. Senators are elected for six years, and Representatives for three, each state having six Senators and a number of Representatives proportionate to its population. The number of Representatives is as nearly as possible twice the number of the Senators. All revenue bills must originate in the lower House, and the course of procedure is similar to that in the Congress of the United States. The Senate may reject an appropriation bill, but may not amend it.

Judiciary. At the head of this department is the High Court of Australia, which has original jurisdiction in cases involving relations with other nations and in cases in which the Commonwealth or any state is a party. Its appellate jurisdiction gives to it the power

to hear appeals from lesser Federal courts and from the supreme courts of the states.

New Federal District and Capital. On January 1, 1911, the national government took

knowledge of it was obtained from a Dutch navigator, who sailed from Java in 1606 and explored a portion of the eastern shore of the Gulf of Carpentaria. Other Dutch navigators



Photo: Wide World

NEW CAPITAL CITY RISING FROM BARREN WASTES

The photograph shows the social center of the capital in 1929. The buildings are of the Hotel Canberra, laid out in a series of wings extending from the main central structure.

over from New South Wales a stretch of land 900 square miles in extent as a Federal Territory, under the name of the Yass-Canberra District; and two years later work upon a new Federal capital was begun. An architect from the United States, Mr. William Burley Griffin of Chicago, chosen in a world-wide competition, was engaged to lay out the city of Canberra, which in time will probably rank with the world's finest capitals. Though the city will not be completed for many years, Melbourne surrendered its position as the seat of the Federal government in May, 1927, when Parliament convened for the first time in Canberra in the unfinished Parliament building.

History. The history of Australia divides itself into two distinct periods—the colonial period and the period of federation; and though the latter is far shorter, it has been of greater moment to the country.

Exploration and Colonization. Vague hints of a land mass in the far-off southeastern seas were common before any definite knowledge was possessed concerning it, and it is not known just when the continent was discovered. At some time previous to 1542, the Portuguese published an account of the existence of a land beyond the East Indies, and it is probable that mariners of that nation were really the first to see the continent. But the first certain

during the next quarter-century pursued the advantage thus gained, and in 1642 Abel Jansen Tasman discovered the large island which now bears his name, but which he called Van Diemen's Land. A few years later, the island-continent was given the name *New Holland*, and this it bore until about the middle of the nineteenth century.

The Dutch made no attempt to establish settlements in the new-found land, nor for a long period was any attention paid to it by navigators of other nations, except for a few casual visits. In 1770, however, Captain James Cook, returning from New Zealand, coasted north along the eastern shore and took possession in the name of England of a great tract which he called New South Wales. To one little indentation where he went ashore, he gave the name of Botany Bay, because of the innumerable strange plant forms which were there found.

Some years later, in 1788, the British sent out to this spot a company of convicts, and a penal settlement was established where Sydney, New South Wales, now stands. Other convicts were later transported, and as their terms expired they acquired land, began to till the soil, and built up a real colony. Adventuring men from England and many serious-minded people from other quarters in search of new opportunities also came, and gradually

OUTLINE AND QUESTIONS ON AUSTRALIA

Outline

I. Position

- (1) Latitude, $10^{\circ} 50'$ to $39^{\circ} 10'$ south
- (2) Longitude, $112^{\circ} 52'$ to $153^{\circ} 34'$ east
- (3) Surrounding seas
- (4) Nearest continent

II. Size

- (1) Length, 2,400 miles
- (2) Breadth, 1,900 miles
- (3) Area, 2,974,581 square miles
- (4) Rank, the smallest of the continents
- (5) Comparative size
 - (a) As to United States
 - (b) As to Canada

III. Shape and Coast Line

- (1) Oblong, compact mass
- (2) Regular coast line; length, 8,800 miles
- (3) Few indentations
 - (a) Great Australian Bight on the south
 - (b) Gulf of Carpentaria on the north
- (4) Islands
 - (a) Tasmania
 - (b) East Indies
- (5) The Great Barrier Reef

IV. Surface Features

- (1) Lacks variety
- (2) Low, rounded mountains
- (3) Arid lowlands
- (4) The Great Plateau

V. Drainage

- (1) Small river systems
- (2) Most important rivers
 - (a) Rivers of the north
 - (b) Rivers of the west
 - (c) Interior rivers
- (3) Lakes
 - (a) Eyre

VI. Climate

- (1) Extremes of temperature
- (2) Coast regions mild and pleasant
- (3) Uneven rainfall

VII. Vegetation

- (1) Peculiarities of plant life
- (2) Semi-desert and tropical types
- (3) Introduction of European plants

VIII. Animal Life

- (1) Interesting and peculiar species
 - (a) Few higher types
 - (b) Marsupials; mammals of primitive class only
- (2) Peculiar and varied species of birds
- (3) Reptiles and fish

IX. Industries

- (1) Rich mineral resources
- (2) Farming
- (3) Stock-raising
- (4) Manufactures

X. Inhabitants

- (1) Aborigines
- (2) Whites
- (3) Uneven distribution of population
 - (a) Cities
- (4) Immigration
- (5) Education

XI. Improvements and Commerce

- (1) Railroads
- (2) Telegraph and telephone systems
- (3) Cable communication
- (4) Radio
- (5) Trade

XII. Government

- (1) Federation of states
- (2) Nominal British control
 - (a) Governor-General
- (3) Universal suffrage
- (4) Departments of government
 - (a) Executive
 - (b) Legislative
 1. Senate
 2. House of Representatives
 - (c) Judicial

XIII. Defense

- (1) Compulsory training
- (2) Australian navy
- (3) Part in the World War

XIV. History

- (1) Colonial Period
 - (a) Exploration and colonization
 - (b) Discovery of gold
 - (c) Steps toward federation
- (2) The Period of Federation
 - (a) Tariff question
 - (b) Exclusion of Asiatics
 - (c) Progress and development

OUTLINE AND QUESTIONS ON AUSTRALIA—Continued

Questions

- What was Australia called one hundred years ago?
Where does Australia rank as to size among the possessions of Great Britain?
If you were sailing from San Francisco to Sydney, what waters would you pass through? In going from Liverpool to Sydney?
Who are the Anzacs?
What city in the western hemisphere is most nearly in the latitude of Sydney?
What point in America corresponds in north latitude to the position of the southern coast of Australia in south latitude?
Does the equator cross Australia? Does either of the Tropics?
What characteristic have the Australian natives that shows they are not negroes?
How does a study of the animals prove that Australia has long been an island?
What steps has the Commonwealth taken toward having a beautiful capital?
Is Australia as far from South America as South America is from Africa?
What effect has Australia's position had on its vegetation?
How do geologists rank Australia as to age among the lands of the world?
What peculiarity have most of the mammals of the continent?
Who were the first settlers of Australia?
What is the attitude toward immigration?
How does Australia prove the falsity of the statement, "All mammals bear their young alive"?
A citizen of what country was the architect who was employed to design the new Australian capital?
Where is it located?
What is the "bush"? What is wattle?
In what stage of civilization are the native peoples?
How large a proportion of the population is made up of them?
How does the date of the great gold rush compare with that in California?
What effect did it have on the history of the country?
What tiny forms of animal life had much to do with making navigation dangerous along the northeast coast of Australia?
How does the density of population in Australia compare with that in Canada?
How has the plant life adapted itself to the arid conditions?
What effect, if any, has the climate had on the distribution of population?
If the entire population of Australia were removed to Queensland would the average density be greater or less than that of the United States?
How does the altitude of the highest peak compare with that of the highest point in Africa? In North America?
What are marsupials?
What progressive system coming into favor in Canada and the United States originated in Australia?
What fruit trees are native to the continent?
How does the head of the government obtain his office?
How is religious instruction given in the schools?
In what direction does the great interior region drain?
How close a supervision has the government over the railroads?
What radical pension system has been adopted?
What is the final court of appeal? Under what circumstances may it be called upon to act?
How does the Constitution resemble that of the United States and differ from that of Canada?
Why has Australia special need of good railway communication?
Are people of all races welcomed in Australia?

the new community became more law-abiding and more attractive to the better class of settlers.

Exploration continued, but not until 1813 did anyone succeed in crossing the mountains and making his way into the interior. The circumnavigation of the island-continent was completed in 1822, and the few rivers were explored practically to their sources. Tales of daring but slightly less thrilling than those told of the great African explorers of the nineteenth century are related of those who at intervals tried to make their way across the continent from north to south or from east to west; more than one determined explorer disappeared into the great interior desert region and was never heard of again. As late as 1896 the journey by direct route from north to south was looked upon as a feat of great hardihood.

Discovery of Gold. Meanwhile, other settlements had grown up along the eastern and southern coasts, and the grassy plains to the west of the mountains had been appropriated by the sheep-raisers. Then, in 1851, came the news that gold had been found at Summerhill Creek, in New South Wales. Later, it was found in Victoria, and the great Ballarat gold field was opened up. Excitement was intense. Settlers who had been making excellent profits from their stock-raising; adventurers who longed for easy wealth; speculators from lands beyond the sea, rushed by thousands to the points where gold had been found. Ordinary pursuits were entirely neglected, the little cities were almost overwhelmed by the crowds that poured into them—2,000 people came to Melbourne each week during 1852—and law and order were practically overthrown. Within a decade the excitement wore off, however, while the states profited by the increase in population and in trade which had come to them.

Efforts toward Federation. The present political divisions were in these early years all distinct colonies, and commerce among them did not thrive, since some had adopted free trade and others had established protective tariffs. It soon became apparent that a union of some kind would be beneficial to all, and as early as 1840, tentative steps were taken in that direction. Not until 1885, however, when a Federal Council was established, was anything definite accomplished, and not all of the colonies joined in this. This body was merely advisory, and could not control matters in any colony.

A national convention held at Sydney in 1891 proposed a union and mapped out the main lines on which it should be organized, but it was six years later before a constitutional convention was actually assembled. The Constitution was submitted to the people of the various colonies in 1898, and two years later,

after having been approved by the people, was submitted to the Parliament of Great Britain. Approved by that body and signed by Queen Victoria, it went into effect January 1, 1901. The Northern Territory was at that time a part of South Australia, from which it was separated ten years later. In 1928 the Northern Territory was divided into two parts, at the meridian of 20° S.; these are called North Australia and Central Australia.

The first Commonwealth Parliament met at Melbourne in May, 1901, and at once entered upon a struggle over the tariff question. Finally, after months of conflict, a protective tariff bill was passed, and the protectionist party has been in the ascendancy during most of the succeeding years. One feature of legislation has been a determined effort to keep out Asiatics, that a "white Australia" may be maintained. Merchants, students, and tourists of other races may enter the country and remain for a time, but none but whites may make their permanent homes there.

The Commonwealth is a country of opportunities and of promise. Such questions as the conflicts between capital and labor, the upkeep of roads, the assisting of agriculture by reduction of freight rates and by the transportation of cattle in times of drought have received careful attention. Farmers who wish to introduce new crops or establish new industries, such as the manufacture of dairy products, may receive assistance from the government, as may those who find their crops threatened by disease or insect pests. After all the years during which it was first a land of myth and later a land of wild adventure, where gold-seekers and bush-rangers lived their perilous lives, Australia has become a settled, self-governing country, and has taken a place among the intelligent, progressive nations of the world. The World War, in which Australia took an active part with the Allies under the British flag, proved a great drain both on the population and the finances of the country. The Australian-New Zealand troops were called *Anzacs*. J.F.M'K.

Related Subjects. The reader is referred in these volumes to the article *BRITISH EMPIRE, AND BRITISH COMMONWEALTH OF NATIONS* for the status of Australia within the empire. Specific details within the continent are outlined under the following titles:

CITIES AND TOWNS

These are described under the various states of the Commonwealth. Canberra is described under its title.

COAST WATERS

Coral Sea	Indian Ocean
Great Australian Bight	Pacific Ocean

ISLANDS

New Guinea	Tasmania
Norfolk Island	

RIVERS

Cooper's Creek	Murray
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STATES	
Central Australia	South Australia
New South Wales	Tasmania
North Australia	Victoria
Northern Territory	Western Australia
Queensland	

PECULIAR ANIMALS	
Bandicoot	Kangaroo
Bower Bird	Lyre Bird
Cassowary	Parrakeet
Dingo	Parrot
Duckbill, or Platypus	Swan
Echidna	Tasmanian Wolf
Emu	Wombat

PLANT LIFE	
Acacia	Eucalyptus
Bamboo	Myrtle
Bottle Tree	Palm

LEADING PRODUCTS	
Cattle	Sheep
Copper	Silver
Gold	Wheat

AUSTRALIAN, *aws tra' li an*, ALPS. See AUSTRALIA (Surface and Features); VICTORIA (Australia).

AUSTRALIAN BALLOT, the name of a system of voting whose essential features are absolute secrecy in the expression of the voter's choice, and the use of printed ballots supplied officially by the state, provincial, or local authorities. It originated in Australia, and has since spread to practically all civilized nations. Before the introduction of the Australian system, it was customary for each

be accounted for, whether used for voting or spoiled, or still clean and unmarked.

Marking the Ballot. In the system as provided in the United States, the names of the candidates for office are arranged in columns under the heading of their respective parties. It is customary to place all the candidates of each party in the order of the importance of their office. Thus, in a state election, first comes the governor, then the lieutenant-

COUNTERFOIL	STUB	1 WM. R. BROWN of the City of Ottawa, Barrister.
		2 FRANK HAMON of the City of Ottawa, Artist.
		3 JOSEPH O'NEIL of the City of Ottawa, Gentleman. X
	STUB	4 JOHN R. SMITH of the City of Ottawa, Merchant. X

THE AUSTRALIAN BALLOT IN CANADA

Ballot papers are kept in a book in each polling division, and contain a *stub* (white perpendicular space shown above) and a *counterfoil* (dark perpendicular space shown above). Both the stub and counterfoil are numbered on the back, and are separated from the ballot paper by a line of perforations between the counterfoil and the stub, and between the counterfoil and the ballot paper. The stub is separated when the voter receives the paper, and its number is compared with that on the counterfoil when the vote is given.

governor, the other state officials, and finally the local officers to be chosen. At the left of the party's name at the head of the column is a circle; if the voter wishes to vote for all of the candidates of that party he may put a cross (X) in the circle. This is called "voting a straight ticket." If, on the contrary, he wishes to vote for some candidates of one party and some of another, he must put a cross in the square at the left of the name of each person for whom he wishes to vote. This is called "scratching," or splitting, the vote or ticket. In a newer form of ballot in local elections all party designations are absent, and the candidates' names are arranged in alphabetical order. In Canada the system is slightly different in detail, and is explained in the description under the illustration of Canada's sample ballot.

Counting the Ballots. When the voter receives a blank ballot from one of the judges of election, his name is checked on the list of

○ REPUBLICAN ○ DEMOCRATIC

- | | |
|---|---|
| <input type="checkbox"/> For Governor
CHAS. S. DOLE
Chicago. | <input type="checkbox"/> For Governor
EDW. F. DUNN
Chicago. |
| <input type="checkbox"/> For Lieut.-Governor
JOHN G. SMITH
Elkhart, Ill. | <input type="checkbox"/> For Lieut.-Governor
ALFRED YATES
Chicago. |
| <input type="checkbox"/> For Sec. of State
J. DOYLE
Greenfield, Ill. | <input type="checkbox"/> For Sec. of State
HARRY WOODS
Chicago. |
| <input type="checkbox"/> For Auditor
JAMES S. McRAE
Urbana, Ill. | <input type="checkbox"/> For Auditor
JAMES J. BRADY
Chicago. |
| <input type="checkbox"/> For State Treasurer
ANDREW RUSSEL
Jacksonville, Ill. | <input type="checkbox"/> For State Treasurer
WILLIAM DOE
Danville, Ill. |
| <input type="checkbox"/> For Attorney-General
WILL H. STEAD
Ottawa, Ill. | <input type="checkbox"/> For Attorney-General
PETER J. LUCEY
Streator, Ill. |

PART OF A BALLOT USED IN ILLINOIS

candidate to have his own ballots printed, and to distribute them to the voters before they entered the polling place. Under this system, bribery and fraud were common. Dishonest politicians were often bold enough to bribe voters and follow them to the ballot box to see that the vote paid for was actually cast.

Under the Australian system, the ballots are furnished by the government. They are delivered in sealed packages to the judges of election shortly before the opening of the polls. When the polls are closed, every ballot must

registered voters [see ELECTION (Registration)]. He then enters a curtained booth, where he may mark his ballot without interference. One of the election officials may legally assist an illiterate voter to express his choice, if the latter requests it. When the voter has marked his ballot, he must fold it in such a way that none of his marks can be seen, but the identification marks previously placed upon it by the judge must be visible. The judge then drops it into the ballot box. When the polls are closed, the ballots are removed from the box and are counted by the judges of election. Any ballots which were not initialed or otherwise marked by an official must be thrown out, because they could have been put into the box only by some unauthorized person. Ballots improperly marked are also not counted.

Greater Honesty in Elections. Under the Australian ballot system, most of the elements of fraud are removed. A voter can secure a ballot only after he enters the polling place, and he marks his ballot free from observation. There is no mark on any ballot to show who cast it. Bribery and fraud, however, are still possible with the consent of the election officials, but honest judges and clerks of election have it in their power to prevent nearly all fraud in the casting or counting of ballots.

Spread of the Australian Ballot. This form of ballot was first used in South Australia in 1856, and later in the same year was introduced into several other of the Australian colonies. For more than a decade little attention was given to the new plan by other governments, but finally, in 1869, it was given a trial at Manchester, England, and in 1872 was definitely established by act of Parliament. Shortly afterward it was introduced into Canada, but for a decade no serious attempts were made to establish it in the United States. A Wisconsin law in 1887 had some features of the Australian system, but the first complete law was that of Massachusetts in 1888. The Presidential election of 1888 was marked by an unprecedented amount of fraud, one result of which was the adoption of the Australian ballot by nine states in 1889. The system is now used throughout Canada and the United States.

AUSTRALIAN BEAR. See KAOLA.

AUSTRALIAN CRAWL. See SWIMMING.

AUSTRIA, *aws' tri ah*, a republic in Central Europe, the nucleus of a once-powerful empire, but now a small inland state outranked in wealth and population by the states that have been formed out of, or enlarged by, its lost provinces. Before the World War the name Austria stood for a state within the Dual Monarchy of Austria-Hungary, in which Austria was an empire, and Hungary a kingdom (see AUSTRIA-HUNGARY, following this

article). The old Austria was made up of the following provinces: Upper Austria, Lower Austria, Salzburg, Styria, Carinthia, Carniola, Trieste, Görz and Gradisca, Istria, Tyrol, Vorarlberg, Bohemia, Moravia, Silesia, Galicia, Bukowina, and Dalmatia, having a total area of 115,832 square miles and a population of about 29,000,000. After the close of the World War, Austria was dismembered, its territory was reduced to 32,369 square miles, and it became a minor state, both politically and economically.

The present Austria consists of nine provinces: the city of Vienna, and Upper Austria, Lower Austria, Salzburg, Styria, Carinthia,



AUSTRIA IN 1914

The form of Austria was more irregular than that of any other country in the world. It is shown in solid black in the illustration. For map of the country since the World War, see article Austria-Hungary, and colored map, in article EUROPE.

Tyrol (northern part), Vorarlberg, and Burgenland (ceded by Hungary). As now constituted, the country is bounded on the west by Switzerland, on the north by Germany and Czechoslovakia, on the east by Hungary, and on the south by Yugoslavia and Italy.

The People. The territory which comprised the old Austria of the Dual Monarchy was inhabited by about ten nationalities. Partly because of the geographical conditions and partly as a reflex of their national aspirations, each of the nationalities retained its own language and customs. There were the Czechs, Slovaks, Moravians, Ruthenians, and Poles in the north; the Slovenes, Serbians, Italians, Magyars, and Croats in the south; and Germans, by a large majority, in Upper Austria, Salzburg, Vorarlberg, and most of Lower Austria. Certain sections of the other provinces were also German; thus the break-up of the monarchy made the territory which was retained as Austria, essentially German. The present total population is approximately 6,535,000.

The Cities. Vienna, the largest city of Austria, has a little less than one-third of the population of the entire country. Gratz,

in the mining district, is the second largest, and Innsbruck, one of the oldest cities, is noted for its historical interest. A detailed discussion of Vienna is taken up in its alphabetical order in these volumes; descriptions of Graz and Innsbruck follow here:

Graz, or *Graz*, *grahs*, capital of the province of Styria, is 140 miles southwest of Vienna. It is situated in a broad and fertile valley, on both banks of the Mur. The cathedral is a notable building, dating from the fifteenth century. The city has excellent railroad facilities, and when conditions are favorable it carries on a large trade in iron and steel goods, paper, woolen, cotton, and silk goods, chemicals and leather. Graz is also noted for its lithographic and printing establishments. It is one of Europe's most ancient cities, but nothing is known of its history previous to the year A.D. 881. Population, 155,000.

Innsbruck, *ins' brook*, capital of the province of Tyrol, is noted for its picturesque situation in a broad valley of the Alps Mountains, nearly 1,900 feet above the sea, and for its many historic associations. For three centuries after 1363, it was the seat of nearly all of the Tyrolese rulers of the House of Hapsburg (see HAPSBURG, HOUSE OF). The city lies on both banks of the River Inn, and its name means *bridge of the Inn*. Lofty snow-capped mountains surround it on all sides, and its spacious streets and many splendid palaces add to its attractiveness. In the city may be seen the oldest Capuchin monastery in Austria, begun in 1502, and a Franciscan church, dating from the sixteenth century. Foremost among its educational institutions is the University of Innsbruck, founded in 1677 by Leopold I. Cotton and wool spinning, glass painting, and the manufacture of mosaics are important industries. Population, 56,000.

Physical Features. Austria is one of the most mountainous countries of Europe; nearly half of it forms part of the Alpine system. The slopes are well timbered, and upland meadows and pastures afford grazing areas. The climate resembles that of Switzerland, with abundant rains, warm summers, and severe winters; there is attractive scenery, diversified by snow-capped peaks, mirror lakes, and green valleys. The only lowland areas consist of the Vienna Basin, where the climate is somewhat severe and the rainfall moderate, and an agricultural section in Burgenland. The great Danube, on which Vienna is located, is the one important river of Austria.

Industry and Commerce. Shorn of its most productive areas, handicapped by lack of working capital, a depreciated currency, and general industrial depression, Austria endured a bitter struggle to maintain its political integrity during the period of reconstruction after the World War. With the help of the League of Nations, it surmounted the worst of its difficulties in commendable manner. Agriculture is the support of over one-third of the population, but the production of foodstuffs is not sufficient to meet domestic needs, and importations are necessary. The available plow land is divided into small farms, and much

of it requires heavy fertilizing. The chief crops are wheat, rye, barley, oats, sugar beets, and potatoes. There is a small yield of corn. The Alpine pastures and meadows are utilized for grazing and the production of hay, and dairying and livestock raising are showing improvement after a period of depression. The principal animals raised are horses, cattle, sheep, goats, and swine.

Austria has a considerable amount of lignite (brown coal) and some anthracite. The lack of sufficient coal of high heating value to supply the needs of iron and steel manufacturers is a drawback, but increasing use is being made of hydroelectric power, thus conserving coal. Iron, magnesite, salt, graphite, copper, zinc, and lead are also mined. The iron ore is plentiful and of very good quality.

The forests of Austria are a valuable source of revenue, supplying lumber for paper, furniture, and pianos, all of which figure in the country's exports. Textiles, iron and steel products, motor cars, and tobacco goods are also manufactured. Scarcity of fuel and unsettled economic conditions are difficulties still to be reckoned with, but the outlook is hopeful.

Because of its limited resources, Austria always has an adverse trade balance, importing more goods than can be produced for export. Trade is carried on with all the neighboring European countries, and with the United States and Great Britain. Austria, like its neighbor, Switzerland, has magnificent mountain and lake scenery, but lack of provision for tourist trade and a position slightly off the main travel routes have kept it from widespread attention until recently. Now hotels and resorts for winter sports are bringing sportsmen and travelers in increasing numbers and a growing amount of revenue from tourist trade. There are over 4,000 miles of railway, well managed and partially electrified.

Education and Religion. The schools of Austria are noted for their high educational standards and for their fine technical training. The school system is complete, from the primary schools to the *gymnasias*, which prepare for universities, and the *realschulen*, from which students go to institutes of technology. There are many schools of higher education, such as a state commercial academy, private commercial academies, agricultural, mining, art, and music schools. The three universities and two technical high schools have a total attendance of more than 25,000 students.

Religious liberty is guaranteed by the government. Over ninety-three per cent of the people are Roman Catholic.

Government. Austria is a Federal republic, and is governed under the provisions of a national Constitution which went into effect on November 10, 1920. The chief executive,

or President, is elected for a term of four years at a joint session of the two houses of the national legislature, and may be reelected once. He is a representative figure only, with no executive powers other than the right of pardon in criminal cases, and without the right of veto; his duties include the appointment of administrative officials proposed to him by the various branches of the government.

The two houses are the Assembly, or *Nationalrat*, and the *Bundesrat* (Federal Council). The members of the Assembly are elected for four-year terms by popular vote. Members of the *Bundesrat* are chosen by the state legislatures on the principle of proportional representation. The Federal Council is merely an advisory body. The executive power is vested in a Ministry or Cabinet of eight members, chosen by the legislative houses.

History. Throughout the Middle Ages and early modern period, the history of Austria was closely intermingled with that of Germany. The nucleus of the present state was a small territory between the Enns and the Raab rivers, which Charlemagne annexed to his empire in 796 as a margraviate, or border province. After the invading Hungarians had been driven out by Otho I, the province became definitely a part of the old German Empire, and as an hereditary possession of the Babenbergs it came to be known as *Oesterreich*, or Eastern Realm. (The word *Austria* is derived from the former name.) In 1156 the margraviate was enlarged and elevated to the rank of a duchy, and after subsequent additions of territory was seized by Emperor Rudolph of Hapsburg. In 1282 Rudolph assigned Austria to his son Albert (Albrecht).

During the two centuries that followed, the duchy was constantly disturbed by wars, either with rebellious subjects or with neighboring provinces, but it grew steadily and increased its influence. Duke Albert V, son-in-law of Emperor Sigismund, succeeded that ruler as king of Bohemia and Hungary in 1438, receiving also the title Holy Roman Emperor,

and the name Albert II. But Hungary became independent in the next generation, and under its patriot king, Matthias Corvinus, took Vienna in 1485, and temporarily drove the

Hapsburgs from Styria and Carinthia. So great, however, had become the power of the Austrian house in Germany that thereafter the Hapsburgs were almost always able to have themselves chosen Holy Roman emperors.

In 1453 Austria was made an archduchy, and gradually, by marriage or inheritance, Spain and the Netherlands came for a time under the same rule, so that Charles V was ruler of the greatest domain in Europe. His brother Ferdinand, who inherited

Austria, spent most of his life fighting the Turks, who in 1529 penetrated as far as Vienna, and exacted an annual tribute for Austrian rule over Hungary. The late sixteenth and early seventeenth centuries were much disturbed by struggles for liberty, religious and political, on the part of Hungary and Bohemia, and the resentment of the latter country at having to accept as king the Catholic Ferdinand II brought on the Thirty Years' War. It was during the reign of Leopold I that the question of the succession to the Spanish throne culminated in the great War of the Spanish Succession. Joseph I succeeded to the imperial throne during this war and, dying before its close, was followed by his brother, Charles VI. The treaty at the close of the war was largely favorable to Austria, which came into possession of the Spanish Netherlands, Milan, Naples, and Sardinia; but in 1720 Sardinia was exchanged for Sicily, and fifteen years later, after the War of the Polish Succession, both Naples and Sicily were lost, and more territory in Northern Italy was gained.

Charles VI tried by the Pragmatic Sanction to secure the throne for his daughter, Maria Theresa, but she was obliged to fight for her possessions with Frederick the Great. She lost Silesia and part of Italy, and in the Seven Years' War unsuccessfully attempted to recover the former. Joseph II was on the throne



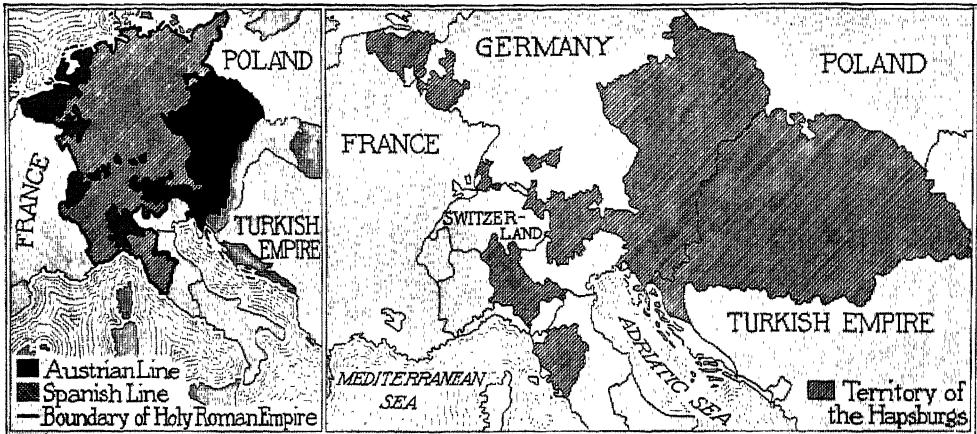
Photo: U & U

A GLIMPSE OF THE CITY OF VIENNA



Photos: U & U

Austrian Scenes. Above: A street in Innsbruck, in the Tyrol; the monument, with majestic hills for a background, commemorates a victory in 1703 over French and Bavarians. Below: School children in devotion before one of the country's wayside shrines. This picture was photographed a short distance north of the Italian frontier.



GROWTH OF THE FORMER EMPIRE

At left: Austria and the Holy Roman Empire under Charles V, who was also king of Spain. At right: Austria and the dominions of the Hapsburgs in 1740, at the accession of Maria Theresa.

when the French Revolution broke out, followed by revolt in Belgium. Leopold II, a statesmanlike ruler, succeeded. As head of the Holy Roman Empire he planned to crush radical republicanism in France, but died before his plans could be put into effect. His son Francis, who came to the throne in 1792, attempted to carry out his father's projects. He also shared in the third partition of Poland.

In the first war with the French revolutionists, Austria, defeated by the young Bonaparte, lost Belgium and the region about Milan, Italy, but was permitted to seize Venice, hitherto independent. When Bonaparte was absent in Egypt, Francis again attacked; Bonaparte returned, defeated the Austrians, and obliged them to give up Tuscany. In 1804, when Napoleon took the title of Emperor of the French, Francis replied by calling himself Hereditary Emperor of Austria. Two years later, after having been crushed at Austerlitz, with the loss of Venice, Dalmatia, and Istria, and having witnessed Napoleon's founding of the Confederation of the Rhine, he renounced the title of Holy Roman Emperor. In 1809 Francis again took up arms against Napoleon, and as a result lost Trieste and other Adriatic territory, the Tyrol, and West Galicia. In the following year, through the marriage of Napoleon with Maria Louisa, daughter of Francis, Austria entered into nominal alliance with Napoleon, but deserted him in 1813 to join in the campaigns which caused his downfall. In 1815, at the Congress of Vienna, the territory lost to Napoleon was all restored to Austria.

From this time till 1848, the dominating figure in Austrian affairs, and to a large extent in those of all Europe, was Prince Metternich. Metternich's policies, which included

the suppression of all liberal tendencies, did not help to solve the three great problems of nineteenth-century Austria—Italy, the Slavs and Hungarians, and influence in Germany.

In Italy there was trouble of long standing. Before Napoleon, the Italians had been content under the rather benevolent Austrian dominion, but the new generation included such patriots as Mazzini, whom the Bonaparte revival of Roman rule had set dreaming of a new and united Italy. Metternich's reply to their aspirations was an attempt to Germanize Italy. In 1820 the people of Naples forced their Bourbon king to grant them a Constitution, whereupon Metternich sent an army and occupied the country. Another army helped crush the revolutionists in the kingdom of Piedmont.

While the flame of national sentiment in Italy was thus being fanned, the same spirit was growing in Austria itself, in a much more complex way. In 1828 Hungary revived its old Constitution and reintroduced the Magyar language; Bohemia followed with attempts to reinstate the Czech tongue; the Slavs, in the south, began a similar effort. In 1846 the Galicians, who are Poles, rebelled. Two years later came revolutions in Hungary, in Bohemia, in Vienna itself. Metternich resigned and fled. When the news was brought to Italy, the people of Milan and Venice drove out the Austrian garrisons, and the king of Piedmont, in the name of all Italy, declared war, thus beginning the movement which made modern Italy and later involved Italy in the World War. In Hungary the revolt was crushed by the soldiers of the Russian czar, in Bohemia by the Austrians themselves; in Vienna it resulted in the abolition of feudal service for Austrian peasants and the abdication of the Emperor Ferdinand in favor of

his nephew, Francis Joseph, who ruled to November 21, 1916. The Italians were defeated, but in 1859 they won Lombardy.

From the time of Napoleon's fall, Austria had struggled with Prussia for domination in the German confederation. Though the latter power had gained influence by its presence in the Customs Union, from which Austria was excluded because the other members did not want Hungary and Italy in their ranks, Austria maintained its traditional leadership until, through the Schleswig-Holstein question and the intrigues of Bismarck, it was drawn into the Seven Weeks' War of 1866. Italy attacked at the same time as Prussia, and the result of the conflict to Austria was the loss of Venice and exclusion from the political affairs of Germany. The question of Austro-German relations was, however, revived by the World War (see below).

Austrian defeat left Hungary in a position to dictate regarding the internal affairs of the country. In 1861 the Hungarian Parliament had been abolished, but now came the *Aus-*

duke Francis Ferdinand, the nephew of Francis Joseph, in 1914, and this act was the direct, though not the sole, cause of the war.

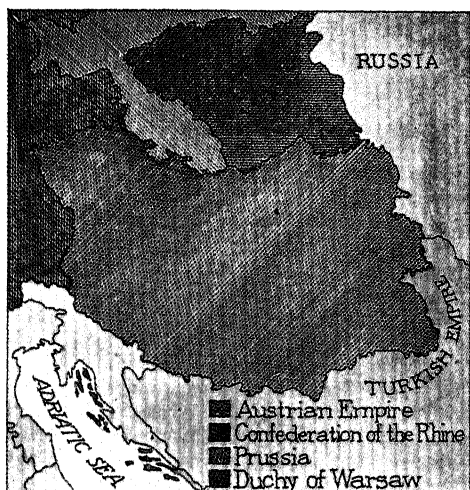


PRESENT-DAY AUSTRIA

Austria was proclaimed a republic on November 12, 1918, a provisional government having been formed in the preceding month. Emperor Charles I, who had succeeded Francis Joseph in 1916, gave up his authority on November 11. The new Austrian state hoped to become a federal state of the new German republic, but the victorious allies feared such an addition to German territory, and in the Treaty of Versailles specifically forbade a union of Germany and Austria. Austria's boundaries were defined by the Treaty of Saint Germain, ratified October 17, 1919.

Shortly after the republic was proclaimed in 1920, Austria was forced to ask for financial assistance. The League of Nations took up the Austrian problems, and recommended an international loan. In 1922 a complete plan of financial reconstruction was adopted, in which Great Britain, France, Italy, and Czechoslovakia assisted Austria. Later, Belgium, Sweden, Holland, and Denmark each guaranteed a small percentage of the loan. In carrying out the reconstruction plan, strict economies were enforced, taxation was increased, and other measures were taken to balance Austria's budget in two years. By 1925 the country had fulfilled seven of the nine conditions of the loan, and the reconstruction was declared an entire success. Although the League of Nations retained control of the country's resources to guarantee payment of the loan, League tutelage was removed from Vienna in January, 1926. In 1929 a new and more democratic Constitution was adopted.

E.L.P.



FROM 1810 TO 1814

gleich, or Compromise, of 1867, which gave Hungary legal equality. The old boundaries of the Austrian empire and the kingdom of Hungary, however, were not changed by the Ausgleich, and the various Slav races combined (Poles, Czechs, Moravians, Croats, Slovenes, Ruthenians) remained in the majority in the Austrian empire.

The story of the Dual Monarchy after 1867 is told in these volumes in the article AUSTRIA-HUNGARY. Austria's part in the World War is described in the article on that prolonged struggle. It was the agitation of the Slav elements against their enforced submission to the Hapsburgs, a movement fostered by Serbia, that led to the assassination of Arch-

Related Subjects. The reader is referred in these volumes to the following articles:

Austria-Hungary
Bonaparte, Napoleon
Charles V (Holy Roman Emperor)
Czechoslovakia
Hapsburg, House of
Holy Roman Empire
Hungary
Italy
League of Nations

Magyars
Metternich
Pragmatic Sanction
Seven Weeks' War
Succession Wars
Thirty Years' War
Vienna
World War
Yugoslavia



AUSTRIA-HUNGARY, also called the AUSTRO-HUNGARIAN MONARCHY and the DUAL MONARCHY, was an important country of Central Europe until November, 1918. Its name had reference to the fact that it was a political union of two different nations—the Austrian empire and the Hungarian kingdom. Also included in the monarchy were the two former Turkish provinces, Bosnia and Herzegovina, annexed in 1908. While Austria-Hungary was under one ruler, it comprised a group of states inhabited by people of many nationalities and conflicting racial sympathies. It was not a nation in the sense that France, for example, is a nation, and its inhabitants were not a distinct people known as Austro-Hungarians, as the people of France are Frenchmen.

The history of Austria-Hungary as one country dates back only to 1867 (see *History*, below). While it occupied a comparatively large area among the countries of Europe, it never achieved the world importance of its neighbors. It was largely shut in, and most of its people were near to poverty. Very soon after its organization, it fell under the influence of its powerful and ambitious neighbor, Prussia, at the north. Indeed, in 1866, Austria had been defeated by Prussia in the Seven Weeks' War and forced out of the German Confederation, while Prussia's success made it the all-powerful state of the German Empire upon its organization five years later. Therefore, from the beginning of Austria-Hungary's history, the Dual Monarchy was overshadowed by its northern neighbor, and on the east the Russian Empire of that day was immensely more powerful.

The area of the Dual Monarchy, including that of Bosnia-Herzegovina, was 261,241 square miles. Only Russia was larger among the countries of Europe. Austria-Hungary was 52,416 square miles larger than the German Empire of the same period, and it was 54,187 square miles larger than France. The Dual Monarchy was slightly smaller than Texas, the largest American state, but it had over twelve times as many inhabitants as Texas. Its population of 51,400,000 gave it an average of about 195 people to the square mile, or over six times the density of population of the United States at the census of 1910,

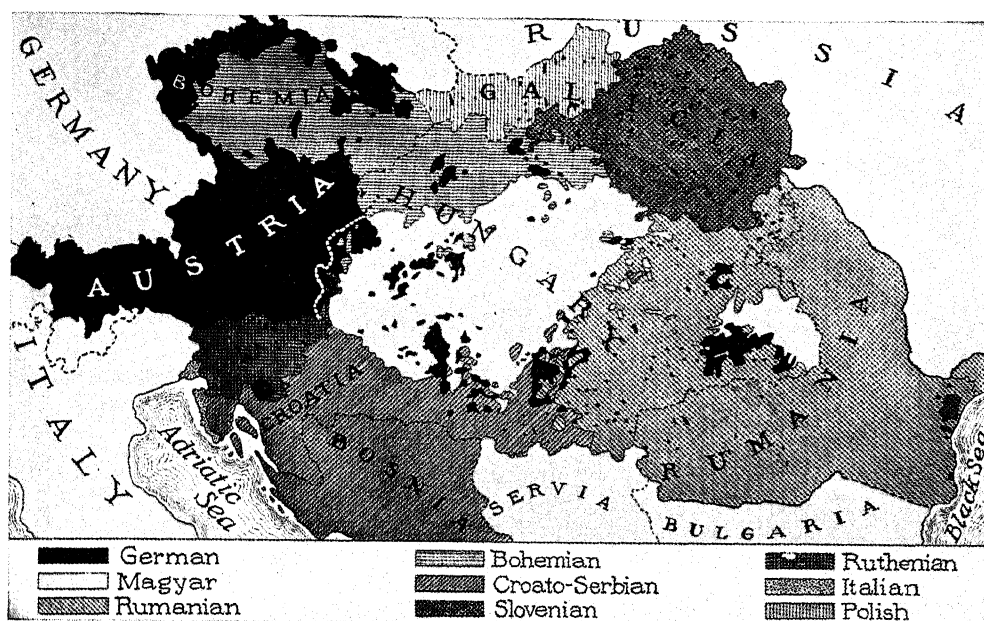
and ninety-seven times the density of Canada's population as a whole. Lower Austria averaged more than 400 people to the square mile.

The World War, which radically changed the map of Europe, so completely destroyed the Dual Monarchy that only the separate names of the empire and kingdom are left to remind us of the former state. These names now are borne by two weak states—the republic of Austria and the kingdom of Hungary; neither political ties nor racial sympathies unite them, and more powerful nations have risen from the dismembered monarchy (see below, *The World War*).

Peoples and Languages. A significant characteristic of the Dual Monarchy was its diversity of races and languages. The United States and Canada have received by immigration representatives of many nations, but the cases are not at all similar. The much-used phrase the "melting pot" expresses very truly the fact that no matter how different these American newcomers may be, they all tend within a few years, or at most within a generation, to become citizens of their adopted country. But in Austria-Hungary, each race was supreme in its own portion of the country. It always resisted the influences of the differing peoples roundabout, and clung closely to its own language and customs.

Most numerous of all the peoples were the Slavs, who made up forty-seven per cent of the whole population; but they were divided into so many linguistic branches that only a student of races would recognize their common Slavic origin (see SLAV). Bohemia, Moravia, Carniola, Galicia, Dalmatia, Croatia, Slavonia, and Northern Hungary were largely Slavic, while the Germans, who comprised twenty-three per cent of the total inhabitants, made up almost the entire population of Upper and Lower Austria. For this reason, the official language of the Austrian empire was German.

In Hungary, however, the Magyars comprised over half of the population of the kingdom, and Magyar was therefore the official tongue (see MAGYARS). A young man in any of the outlying provinces of Hungary, whether the northern Slavic portion or the Rumanian section of Transylvania, had to make himself as familiar with the Magyar language as with his own if he wished to enter political or



RACIAL MAP OF THE OLD DUAL MONARCHY

In few other civilized countries was there greater confusion of tongues.

diplomatic circles. Of Jews there were over 2,500,000—more than a sixth of all the Jews in the world; of gypsies about 95,000, and a considerable number of Armenians. (For distribution of these numerous races, see accompanying map.)

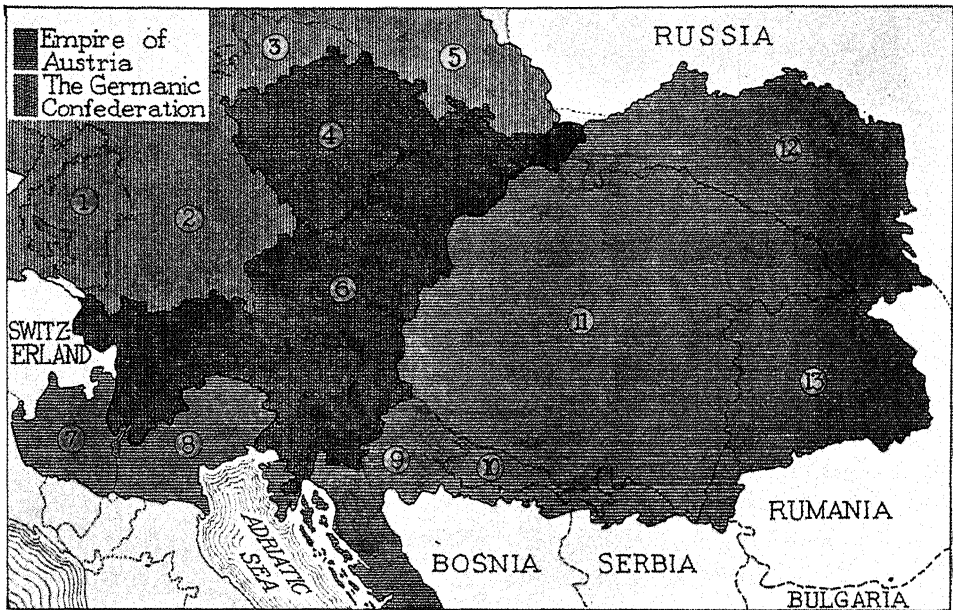
Government. Although Austria and Hungary each maintained its own Parliament, at Vienna and Budapest, respectively, there were certain functions in which both participated. Thus, questions of national finance, war, and foreign relations were dealt with by two delegations of sixty members each, one chosen by the Austrian Parliament and one by the Hungarian. These met one year at Vienna and the next at Budapest, and held their sessions separately. The results of the deliberations were sent from one to the other in writing, and if after three such interchanges the delegations failed to agree, they met for voting, but not for discussion.

History. For the history of the two monarchies before 1867, see, in these volumes, the articles *AUSTRIA* and *HUNGARY*.

Eighteen sixty-seven was the year of the *Ausgleich*, or agreement, by which the two sovereign states were made one monarchy, with a single ruler and a single flag. The position of the two countries at that time explains the peculiar arrangement: Hungary, ever eager for independence, was almost, but not quite, strong enough to demand it; Austria, its weakness made plain by the rapidity of Prussia's victory in 1866, felt obliged to

make concessions; and with one demanding all that it dared, the other conceding only what it must, a carefully balanced plan was worked out to give neither the upper hand. At the same time, the interests of the other races, an actual majority in the Dual Monarchy, were ignored. Naturally, since such feelings lay back of it, the arrangement was never quite satisfactory to either side. The high-spirited Magyars, the Czechs of Bohemia, and the Slavs of both north and south displayed increasing desire for independence. The Parliaments of Austria and Hungary were probably the most turbulent in the world, and the struggles of the members were not always confined to words.

Foreign Affairs. Exclusion from Germany turned Austria's attention in another direction, and after 1866 the Balkan question was Austria's chief problem. At that time, Turkey still bordered Austria on the Adriatic, and Serbia, Bulgaria, and Rumania were vassals of the sultan. Austria wished to assume the rôle of protector of the Balkan Slav peoples against Turkish oppression, but Russia, a nation of Slavs, had the same desire. Austria's dream was to extend its empire southward to the Mediterranean, since the establishment of the kingdom of Italy had made its ports on the north of the Adriatic of little value in war-time. Russia had long contemplated a similar expansion. This rivalry, after nearly setting Europe aflame with war several times, became one of the chief causes of the World War.



AUSTRO-HUNGARIAN MONARCHY AS IT EXISTED TO 1918

From the Congress of Vienna (1815) to the Cession of Lombardy (1859) and of Venetia (1866).

- | | | |
|---------------------------|--------------|---------------------------------|
| 1. Kingdom of Württemberg | 6. Austria | 11. Hungary |
| 2. Kingdom of Bavaria | 7. Lombardy | 12. Galicia, or Austrian Poland |
| 3. Kingdom of Saxony | 8. Venetia | 13. Transylvania |
| 4. Bohemia | 9. Croatia | |
| 5. Prussia | 10. Slavonia | |

When Russia freed the Balkan nations and added to its own territory in its war with Turkey in 1877, the other powers granted Austria the administration of Bosnia and Herzegovina, which were still, however, considered Turkish provinces. In 1908, after the Turkish revolution, Austria annexed them. This act angered Serbia and Montenegro, and each threatened war. At the close of the Balkan War of 1912-13, Austria led the other powers in preventing Serbia from obtaining Saloniki or a port on the Adriatic, and in setting up the independent state of Albania out of territory conquered by Montenegro, Serbia, and Greece. See ALBANIA.

On June 28, 1914, the Archduke Francis Ferdinand, a nephew of the aged Emperor Francis Joseph, and heir to his throne, was assassinated at Serajevo, the capital of Bosnia, by a Serbian student. Austria declared the plot to be a part of the agitation to unite all the Slavs under Serbian rule, asserted that it was backed by the Serbian government, and demanded that Serbia officially condemn the Pan-Slav agitation, suppress anti-Austrian books, newspapers, and societies, and permit Austria to handle the investigation of the outrage and determine what Serbian officers and officials should be discharged. Serbia accepted most of these conditions short of actual Aus-

trian interference in its affairs, but Austria was not satisfied. Russia's determination to prevent the loss of Serbia's independence further complicated the situation, and Austria-Hungary's declaration of war against Serbia on July 28 was but the first of the long list of declarations that soon involved most of Europe in war.

The World War. Elsewhere in these volumes, under the heading WORLD WAR, is given a detailed account of the war declarations and subsequent events, ending with the surrender of Austria-Hungary and Germany and their allies, Turkey and Bulgaria. It should be noted here that during the war all of Austria's old problems were revived or intensified—problems of its relations with Germany; its possession of territory claimed by Italy; the unrest of its diverse nationalities.

The German question came to a focus through Prussian successes and Austrian failures early in the war. Prussian-trained generals and officers were obviously superior, and were given commands in the Austro-Hungarian army. Austria was the weaker, and soon became the subordinate member of the alliance. The struggle against the surrounding nations seemed to foster a German determination to become independent of the rest of the world, and one of the schemes



AUSTRIA-HUNGARY AS IT WAS; AUSTRIA AND HUNGARY AS THEY ARE

The shaded portions show the extent of the Dual Monarchy before the war; the black portions include the territory now left to the two countries. Rumania was awarded Transylvania by mandate of the League of Nations.

proposed for consummation after the war was a Customs Union which should include Austria-Hungary. Austrians opposed this plan, because the better organization of German industries would give the latter an advantage; Hungarians opposed it for a similar reason and because, as an agricultural people, they were already discontented with the tariff union with Austria. There was fear, too, that Germany hoped for political domination in the new union. As a matter of fact, when the war ended, the nucleus of Austria, strongly German, hoped to unite with the German republic, but was expressly forbidden to do so in the treaties of Versailles and Saint Germain.

The Italian people had never been satisfied with the territory acquired from Austria by the Seven Weeks' War. They looked upon the large numbers of Italian-speaking people in the Tyrol, in the region east of Venice, and in Dalmatia, as their brothers, and they called these lands *Italia irredenta*, unredeemed Italy. For strategic reasons, too, Italy wished the eastern shore of the Adriatic. Nevertheless, at the outbreak of the war Italy was Austria-Hungary's ally. In 1879, Austria-Hungary

and Germany had formed a protective alliance against Russia and France; Italy had joined them in 1882, after the French occupation of Tunis, thus forming the Triple Alliance (which see). One of the provisions of the treaty was that if either Austria-Hungary or Italy should occupy territory in the Balkans, the other should be compensated. On the basis of this agreement, Italy, while still neutral, demanded territory in return for Austria-Hungary's occupation of Serbia, and insisted that the territory ceded should be a part of *Italia irredenta*, the Trent and Trieste. Because Austria would not agree to all of Italy's demands, the Italian government entered the war on the side of the Allies in May, 1915.

During the war, differences arose between the United States and Austria-Hungary regarding the former's shipment of munitions to other powers and the latter's attacks on the *Ancona* and the *Petrolite*. The United States also requested and secured the withdrawal of Austro-Hungarian Ambassador Dumba for complicity in plots to interfere with the making of munitions. In December, 1917, eight months after it entered the war as a foe of Germany, the

United States declared war against the Dual Monarchy.

It is only necessary to record here the complete defeat of the German-Austrian-Turkish-Bulgarian alliance, in November, 1918, and the effect on Austria-Hungary. Emperor Charles of Austria, who had succeeded to the throne on the death of Francis Joseph, in 1916, was driven from Vienna, and ultimately from the country. He died in 1922. The dismemberment of the Dual Monarchy was inevitable. The Czechoslovaks in Bohemia, Moravia, and Northern Hungary, an intelligent, ambitious people, formed the republic of Czechoslovakia, with a wise man, Professor Thomas Masaryk, as its President. The South Slavs of Bosnia-Herzegovina, Dalmatia, Croatia, Slavonia, and Slovenia united with Serbia and Montenegro to form the Kingdom of the Serbs, Croats, and Slovenes, the nation commonly called Yugoslavia. To Italy were ceded the southern part of Tyrol, Trieste, Istria, and, eventually, Zara and Fiume. Austria and Hungary each sank to the position of a minor state, losing territory not only as indicated above, but ceding other sections to Rumania and Poland. (The territorial changes are given explicitly in the articles indexed below.) Austria and Hungary signed separate peace treaties with the Allies, Austria accepting the Treaty of Saint Germain, and Hungary the Treaty of Trianon. Ratifications were not exchanged until 1920.

E.L.P.

Related Subjects. The geographical and economic features of the lands comprising the Dual Monarchy are described in the various articles listed below. The list also includes topics having supplementary and collateral information:

Balkan Wars
Berlin, Congress of
Hapsburg, House of
Russo-Turkish Wars
Saint Germain, Treaty of

Seven Weeks' War
Trianon, Treaty of
Triple Alliance
Versailles, Treaty of
World War

STATES

Austria
Czechoslovakia (with list)
Germany
Hungary
Italy
Montenegro

Poland
Prussia
Rumania
Russia
Serbia
Yugoslavia (with list)

UNCLASSIFIED

Budapest
Charles I

Czech
Fiume

Francis Joseph
Magyars
Slav

Trieste
Tyrol
Vienna

AUSTRIAN SUCCESSION, *aws' tri an suk-ses' shun*, WAR OF THE. See SUCCESSION WARS (War of the Austrian Succession).

AUTOCRAT OF THE BREAKFAST TABLE, the title of a book held by some to be the most popular and interesting work of Oliver Wendell Holmes. In it, his wit and humor, his kindly philosophy and delightful style are combined with the ease and charm of conversation which always distinguished him; for the *Autocrat* is simply the conversation at the breakfast table of a Boston boarding house. Holmes himself, the Autocrat, does most of the talking, but the Schoolmistress, the Young Man Called John, the Old Gentleman Opposite, and several others are very clearly characterized. The book comprises a collection of sketches which first appeared in the *Atlantic Monthly*, in 1857 and 1858; up to that time Holmes had only a local reputation, save as the author of the poem *Old Ironsides*, but with the publication of these he at once became a man of literary note. See HOLMES, OLIVER W.; AMERICAN LITERATURE (National Period).

AUTOGRAPH, *aw' toh graf*. In all ages the handwriting of famous men and women has been of interest. In the most ancient times of which we have record, manuscripts were frequently preserved, sometimes because of their historical importance, but also because they were in the handwriting of noted people. One of the Ptolemies of Egypt is said to have exchanged wheat for the privilege of copying the manuscripts left by Aeschylus, Sophocles, and Euripides, and the elder Pliny speaks of seeing a collection of autographs of famous men who lived two centuries before him.

The interest and value of autographs depend on the fame of the writer, on the relative scarcity of specimens, and also on the historical or other interest of the particular example. A letter in which Christopher Columbus announced the discovery of the New World would be priceless; all of the twenty-nine authentic Columbus autographs are in the hands of his descendants and may never be sold. A letter written by Americus Vesputius to his father is one of the priceless gems in the British Museum, which probably has the greatest autograph collection in the world. Six hours before her death, Mary Queen of Scots wrote to King Henry III of France, asking him to take care of her son "as much as he deserves it"; this letter is also in the British Museum. Among other famous people whose autographs are very rare are Leonardo da Vinci, Raphael, Sir Francis Drake, Sir Thomas More, and John Milton.

The value of an autograph depends greatly on the character of the specimen. A signature



KARL FRANZ JOSEPH

Succeeded Francis Joseph on November 21, 1916. Abdicated, November 12, 1918. Died, 1922.



AUTOGRAPHS OF FAMOUS PEOPLE

Reading each column downward, the signatures are those of Oliver Cromwell, Benjamin Disraeli, Charles Dickens, Walter Raleigh, Ferdinand Cortez, William Shakespeare, George Washington, Abraham Lincoln, John Milton, Robert E. Lee, Rene de la Salle, Christopher Columbus, Henry VIII, Queen Elizabeth, Walt Whitman, Thomas Jefferson, John Wesley, James Whitcomb Riley, Francis Bacon, Mary Stuart, George III, Robert Burns.

of George Washington is worth perhaps \$20 to \$40, whereas an entire letter in his handwriting has sold for as much as \$500 or \$600. A letter to his father, in which Ulysses S. Grant announced his enlistment in the Union army, was sold for \$910, but letters of his having no particular interest may be bought for \$10 to \$40. In December, 1860, Abraham Lincoln wrote to his friend, Lyman Trumbull, about the possibility of compromise between the North and South; this letter was sold in 1914 at public auction for \$1,100. At the same time, a letter from Lincoln to Grant, written on April 6, 1865, only three days before he was shot, was sold for \$1,375. Autograph letters by Keats, Shelley, Charlotte Corday, La Salle, Marquette, Frontenac, John Eliot, Peter Minuit, and Nathan Hale are valued highly.

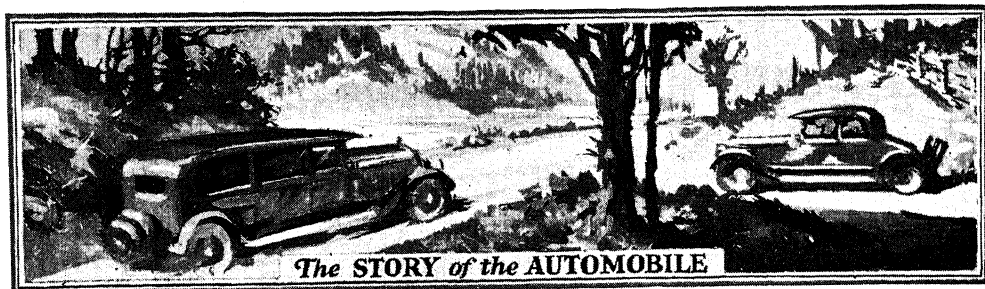
For the Young Collector. The beginner cannot hope to acquire such almost priceless autographs, but he can start with those which are within the limits of his purse. Many living men of prominence are glad to grant requests for autographs. The seeker for autographs should be careful to spell names and addresses correctly, not like one careless or ignorant collector who wrote to Robert Louis Stevenson but spelled his name Stephenson. The beginner must not be discouraged, however, if his pleas are rejected. He should remember that he is asking favors of men and women who probably receive many similar requests every day.

AUTOGYRO. See AIRCRAFT, subhead.

AUTO-INTOXICATION. This word means poisoning of the body with its own products, but the term is very loosely applied. Most persons use it as meaning the ill effects which result from constipation. Others use it as a substitute for another worn out word, "bilious-

ness," meaning a certain ill feeling or discomfort which is supposed to come from a combination of heavy eating of rich foods, a lack of

exercise, and constipation. See HEADACHE; for helpful suggestions on sane living, see LIFE EXTENSION. W.A.E.



The STORY of the AUTOMOBILE

AUTOMOBILE. One of the basic needs of people is for transportation. The various races of men have developed different methods of transporting themselves and their goods from place to place. The primitive methods were crude, and were based on the muscular effort of men or animals. The Eskimo, with his dog sled, is an illustration of efficient transportation under difficult conditions. Living in the midst of ice and snow, it is necessary that he possess a vehicle able to slide easily over frozen surfaces. The animal best adapted to his use is the strong, fierce dog, which can be trained to hunt and draw a sled, and which can live in the rigorous climate of the far north.

Transportation a Large Factor in Civilization. It is almost literally true that the state of civilization of a country or race corresponds closely with its transportation facilities. This is so, because mankind is not independent of his fellow creatures, but lives best in relationship with others. Men need to exchange ideas in order to enlarge their own understanding; they need to exchange goods in order to utilize the products of the world for their welfare and comfort.

Since transportation is fundamental, any invention which renders it easy and cheap is a benefit of the first magnitude. Not many years ago the world was living in the age of the horse. Notwithstanding the fact that the nineteenth century witnessed the development of power-driven machinery for industrial uses, the horse was the chief agency for transporting goods and people. True, there were railroads for long journeys and for hauling heavy freight, but the everyday burdens of life were borne by the faithful horse. Life in the nineteenth century would have been of an entirely different character without the horse as its main burden-bearer.

The physician making his calls; the ranchman herding his cattle; the pioneer settling the West; the contractor erecting great buildings; the farmer bringing the world's food to market—all these essential activities and many others would have required a far greater expenditure of time and labor without the assistance of the horse, "man's best friend."

Those who have enjoyed the privilege of living at the beginning of the twentieth century have had the opportunity of seeing the transformation brought about by a change to a mechanical means of transportation. The automobile has completely made over our business practices, social customs, and recreational activities. It has carried us into a new world. We are no longer hampered by the limitations of time and space. We are free to come and go swiftly and pleasantly.

A Sharply Drawn Picture. Perhaps a contrast with a more primitive condition in Central Europe, which will not greatly change for many years, will give us a better realization of our indebtedness to the automobile. The following incident is related by Michael Pupin, scientist and inventor, as having occurred on his return to his native country of Serbia after he had lived fifty-four years in the United States. He says, in *Scribner's Magazine*:

Nine years ago I was invited by the Serbian government to study the condition of the Serbian war orphans, and I accepted the invitation. A Ford car, a Serbian soldier as driver, and a young priest as guide, assisted me in the performance of my mission. One day as we speeded along a stretch of a narrow, level road in the southwest corner of Serbia, I saw in the distance a Serbian peasant, with his oxen and cart, standing by the side of the road and waiting for my machine to pass. When I got near him I stopped, got out, and shook his hand, thanking him for the courtesy.

For practical purposes, distances are measured by the watch, not by the map.

MACAULAY.

If all of our mechanical power were measured in the ancient way, in terms of manpower, we would each of us on the average have a train of twenty able-bodied slaves waiting on us day and night.

E. E. SLOSSON: *Gasoline as a World Power.*

"Oh, don't thank me," said he; "this is the least that I can do for an American. You Americans have been most kind and generous to us Serbians during the recent war. You banished typhus from Serbia and we shall never forget it."

"But how do you know that I am an American?" asked I, and he answered:

"Your looks and your language suggest a Serbian, but your manner is different. No European of your class has your manner; it is the cordial and gentle manner of the Americans who came to aid us during the war. Besides, no Serbian can afford to-day the luxury of an automobile, nor is he in sufficient hurry to need its speedy service. This cart with its slowly moving oxen is speedy enough for me."

"But you are not going very far," said I. "To Belgrade," said he; "I shall be there in a fortnight, whereas you probably left Belgrade yesterday morning. You, like all Americans, are in a hurry; I, like all Serbians, am not. After selling these ten bags of tar it will take me two weeks more to return to my farm on the slope of that mountain over there."

"But how can you spare the time at this busy summer season?" asked I, and he answered:

"I have just finished the hoeing of my cornfield, and by the time the harvest season is on I shall be home again. Time is not so very precious to us peasants until a week or so after Saint Peter's Day."

"But the travelling expenses of your four weeks' journey will eat up all the proceeds from the sale of your ten bags of tar," said I, and he answered:

"I have no traveling expenses. This time of the year my oxen and I sleep out under the canopy of heaven; my friends and acquaintances along the route will feed me and my faithful oxen. Half a loaf of black bread and a raw onion or two are my daily diet on these journeys; there are juicy pastures on every side for my oxen. In exchange for their hospitality I shall give my friends several new ballads which I recently learned from the shepherds on my mountainside. My friends on whom I expect to call undoubtedly have similar treasures of new tunes and ballads, and they will not begrudge me a tiny share of them. While wandering slowly in daytime, I shall have plenty of leisure to explore again the beauties of dear old Serbia; at night I shall rejoice in the glory of the blazing stars, which to me are like the eyes of God watching over the destiny of my beloved Serbia, just as they watched during this recent war. You see, then, that when I get home again I shall have all the dinars which Belgrade gave me for my ten bags of tar, and my dearly beloved oxen will be slicker than ever. Besides, my flute will be richer by several tunes, and my heart will be fuller than ever with love for my beautiful Serbia."

How far away this seems from our times and ideas! No doubt we should conclude, as did the writer of this story, that it is preferable to ride in the automobile and be a citizen of a country which has been called "the land of machines."

What Automobile Transportation Means. The benefits resulting from the change to a mechanical means of transportation are obvious.

The automobile has made extensive travel possible to many people who formerly were unable to enjoy the benefits which travel gives.

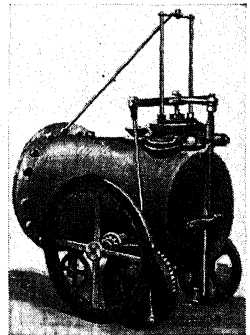
It has broadened their knowledge of their country and increased their acquaintance with people and customs in distant places. It has extended the borders of our cities, making it possible to live many miles from the business centers. It has enriched life in rural communities, by bringing the facilities of the town within a few minutes' ride of the country home. It has heightened our appreciation of the beautiful; the very form of the motor car presents esthetic values.

All these advantages make the automobile a necessity of modern life, a valuable contribution to our needs and our enjoyments. So popular has it become that traffic problems, parking problems, and road-building problems are now among the foremost which concern every community. The above refers particularly to pleasure cars. Motorbus operation has grown to amazing proportions, and includes lines for both passenger and freight traffic.

Beginnings. The word *automobile*, which means literally *self-movable*, is the name popularly given to all forms of self-propelled vehicles, except traction engines and railway locomotives, which are built for carrying passengers and goods and fitted to run on streets and roads without a track. Though Sir Isaac Newton, in 1680, invented a toy horseless carriage, it was more than two centuries later before the automobile became of practical use. It was not until after 1890 that the experiments of many inventors began to bear fruit, and a few pioneers began to buy the new style of vehicle.

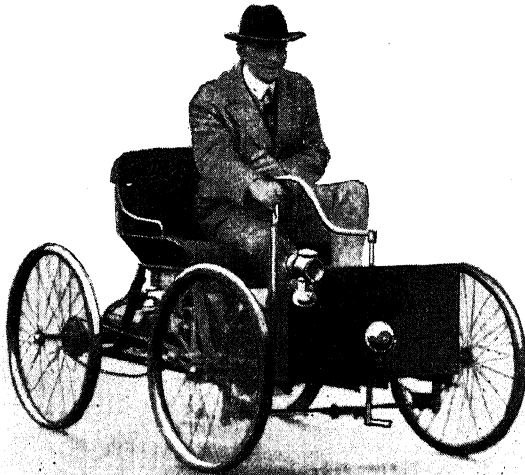
But the automobile was still regarded as an expensive plaything, interesting enough, but of no practical use. England, for example, thought so little of the value of the new machine and considered it such a dangerous agent that a law, enforced until 1896, forbade automobiles to speed at more than four miles an hour, and required that a man waving a red flag should precede every power-driven vehicle! Other countries placed no such burdens on automobiles, but gave them little encouragement.

One of the first automobiles ever made was the Haynes car. This machine consisted of a carriage body, with a one-cylinder gasoline engine taken from a motor boat. A bicycle chain was used to connect the engine to the rear wheels.



THE IDEA EXISTED IN 1797
Trevithick's road locomotive, the first self-propelled vehicle ever constructed.

There was so much objection to its being driven on the streets of Kokomo, Ind., where it was constructed, that the inventor used a horse to tow it out into the country before



Charles B. Duryea, sometimes called the father of the American automobile, Elwood Haynes, Alexander Winton, Frank B. Stearns, R. E. Olds, and Henry Ford. Ford began to build his first machine in 1894, and finished it two years later; his factory was able later to turn out finished cars at the rate of more than a million a year, and eventually nearly two million every year.

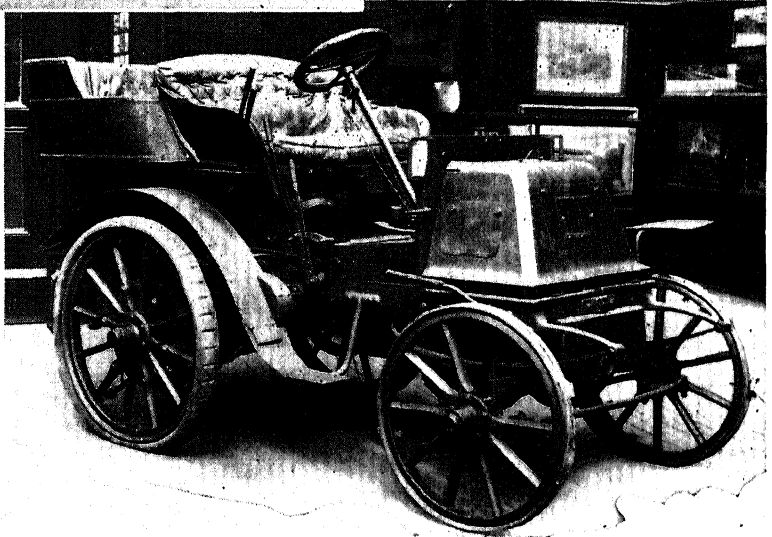
In the early automobiles built by these and other men, the propelling force was derived from an internal-combustion engine. Various fuels have been tried at one time or another, but gasoline is the only one now in general use. Though the increasing cost of gasoline has led to experiments with possible substitutes, none of these has yet taken its place.

First Races. The first automobile race was held in 1894 from Paris to Rouen, a distance of about eighty miles. The first race in America was held on November 2, 1895, at Chicago,

trying to run it under its own power. But in spite of its defects and its great uncertainty of operation, it established the practicability of the "horseless carriage," and furnished a basis for the beautiful and efficient car of to-day.

All of the pioneers who tried to construct a self-propelled vehicle, from the days of Sir Isaac Newton almost to the end of the nineteenth century, used steam as a motive power. In 1872 George B. Selden of Rochester, N. Y., applied to the United States for a patent to cover a new idea, the application of an internal-combustion engine to a self-propelled vehicle. The patent was not granted until 1895, and by that time there were other inventors using the same idea.

There is some uncertainty as to who was the first to make a gasoline automobile, due to the fact that several men were working on the problem at the same time. Among them were



A CARRIAGE FIT FOR A KING

Photos: P & A; U & U

In the second illustration is shown the first motor car owned by the sovereign of Great Britain. It was as fine a car as King Edward VII could buy. It is now permanently exhibited at Hull, England. Above, Henry Ford is driving the first car made by him. This car was never sold; on the day in 1927 when the fifteen-millionth Model T Ford was manufactured, he drove the diminutive first model through the streets of his city.

over a course of ninety miles. Two cars started, but only one car finished, covering the ninety-mile course after eight hours forty-eight minutes of clattering and puffing. During the race this automobile consumed five and one-half gallons of gasoline, stopped ten times for repairs, and made an average speed of nearly ten miles an hour. The automobile was

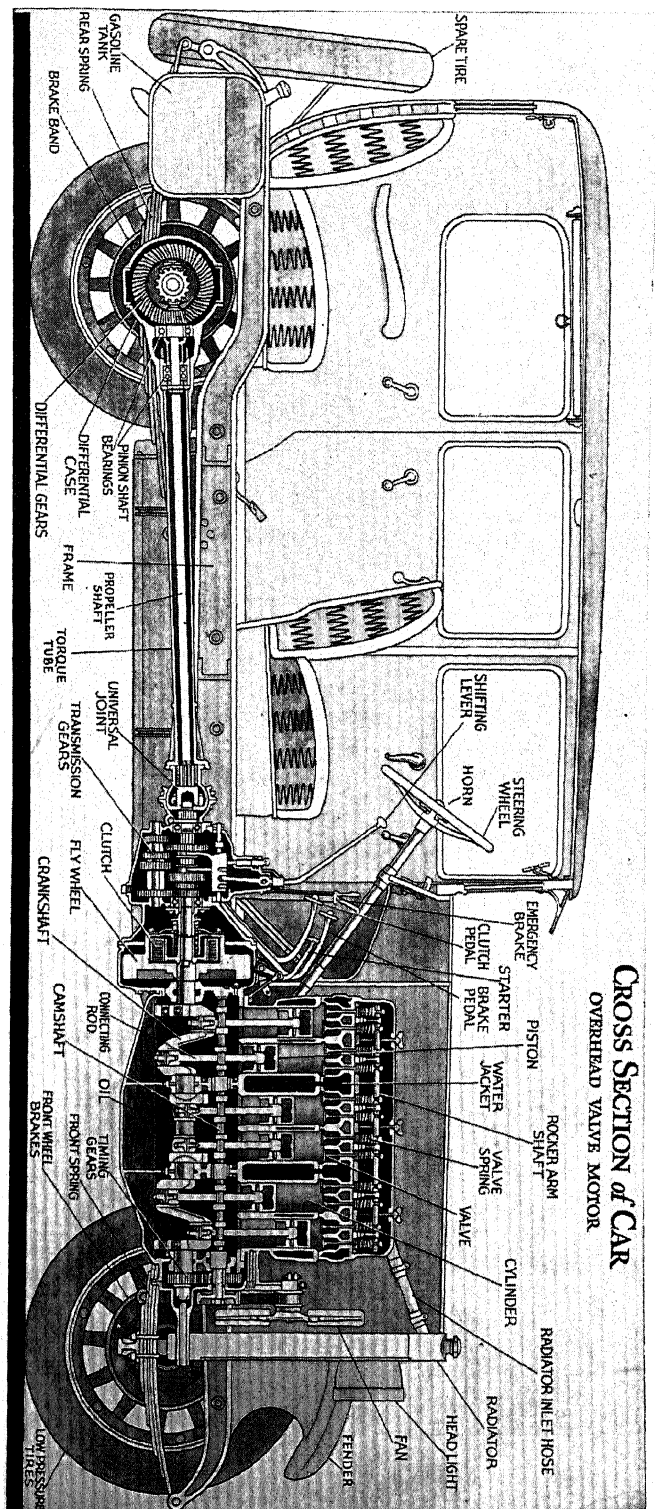
stopped several times to take on supplies of gasoline and cakes of ice, the ice being placed in a receptacle attached to the motor to cool the engine.

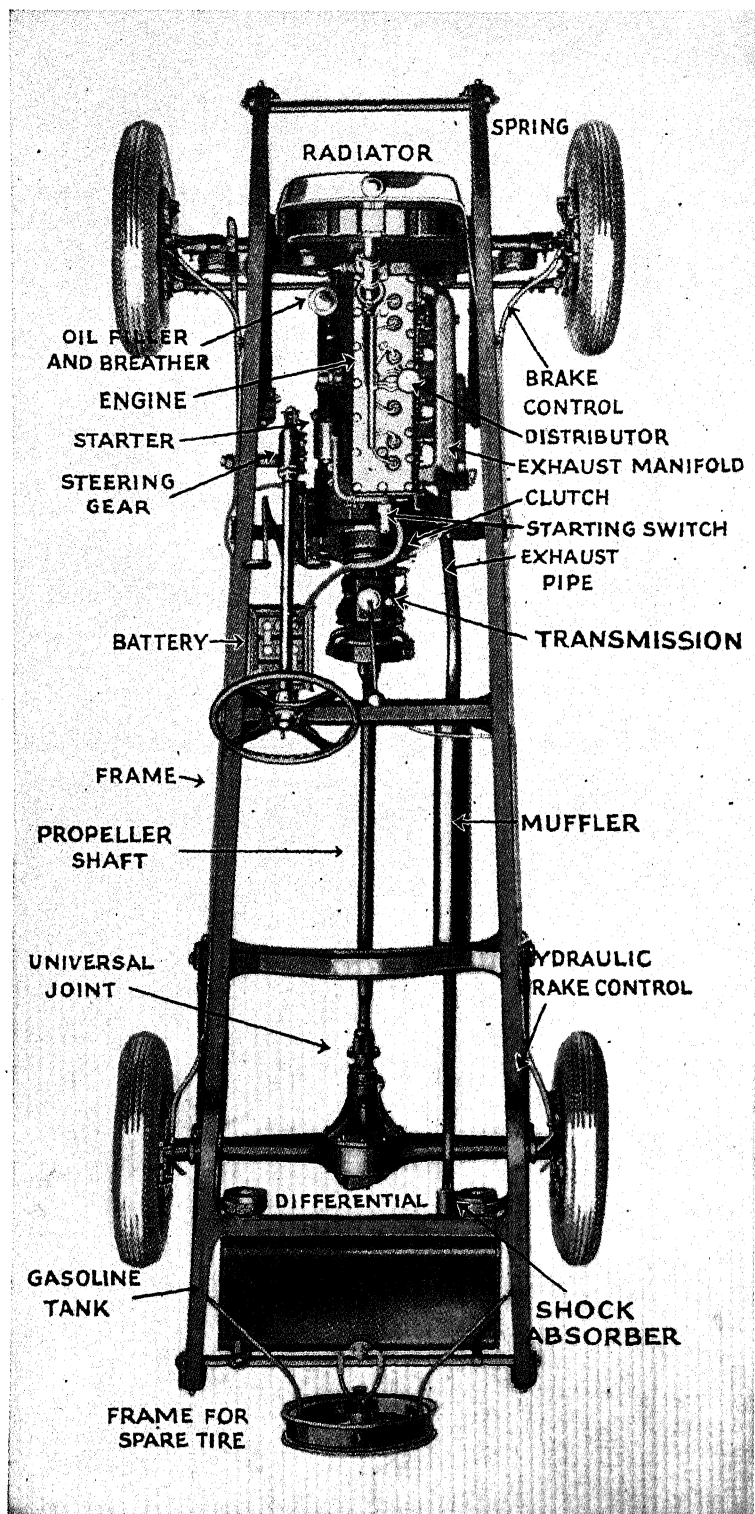
These details seem laughable in this day of swiftly moving, high-powered, and efficient machines, but in 1895 they aroused a general public interest that laid the foundation for the present great industry.

Present-Day Motor Cars. The enormous increase in the number of automobiles has been due to the great reduction in prices. In 1899, when they were still novelties, the average price of a runabout was \$1,300; a touring car seldom sold for less than \$2,500. In 1907 the average price was \$2,100; after the war, prices greatly advanced, but by 1924 had been beaten back nearly to pre-war prices in many notable instances. Prices then ranged from \$295 to \$16,000; to-day there are several makes of cars of sturdy design, handsome in appearance, which sell for less than \$750; in the high-price class, there is ample opportunity for choice.

Once the automobile was a luxury reserved for the rich; now it is a convenience and in many cases a business necessity for persons in moderate circumstances. At the same time, American manufacturers have learned how to create the most expensive automobiles, suited to the most fastidious tastes. Only a few years ago it was the fashion, among those who could afford it, to buy only French, German- or English-made automobiles. To-day the United States is not only making automobiles equal to those in any other country, but is actually exporting over \$700,000,000 worth of them a year. Besides, eighty per cent of all the world's automobiles are owned by American citizens.

The Chassis and Body. An automobile consists of two main parts, the *chassis* and the *body*. *Chassis* is a French word pronounced *shah' se*, and originally meant the mounting or station-





any part of a cannon in a fortress; it is the foundation for all the parts which are movable and are used to raise or turn the gun. In an automobile the chassis comprises the frame, wheels, springs, motor, and the mechanism by which power is transmitted from the motor to the wheels—in fact, everything essential to the operation of the machine. Sometimes the engine and transmission are not included in the term. All the rest of the structure, which merely provides accommodation for passengers or goods, is called the *body*. The body and chassis are entirely distinct, and it is possible to transfer a single body from one chassis to another, and also to use several bodies at different times on the same chassis. The process may be compared to a man changing his clothes. Not every automobile body, of course, will fit any chassis, any more than every suit will fit any man. Manufacturers usually standardize the chassis, and make the body in a variety of styles to suit the individual tastes and needs of buyers.

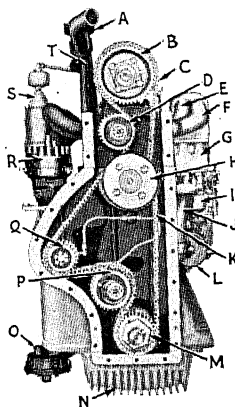
Styles and Uses of Automobiles. The word *automobile* was created to meet a sudden demand for some term which would describe a "horseless carriage." There has been, recently, a tendency to substitute other terms, such as *motor car*, either *motor* or *car* alone, and *motor*

vehicle. The British, in fact, have never used the word *automobile*, but have adopted the term *motor car*. The use of automobiles for business purposes has also led to the use of the term *motor truck* for the larger and heavier vehicles. As the word *automobile*, moreover, is really a French adjective, there is good reason for substituting a noun such as *car*, *truck*, or *vehicle*.

The variety of purposes for which automobiles are now used has led to the creation of several distinct types of cars, each of which is described in detail below.

1. *Passenger Automobiles*. These may be divided into two classes, open and closed types, the latter greatly exceeding the former in popularity. There is wide variety in the styles of bodies and the names used to designate them. Those here given are the terms commonly used in the trade. The *phaeton*, or touring car, is an open-type car, with two cross seats for four or five passengers. Sometimes two additional single, folding seats are provided. The top is collapsible, and may be folded at the back of the tonneau. Removable side curtains enclose the sides in inclement weather.

The *roadster* is similar to the phaeton, but smaller, having one seat for two persons, and a luggage compartment in the rear; sometimes the latter is converted into a seat for two persons, called a rumble seat. The *coupe* is an enclosed car, with one seat for two passengers. In some cases a special arrangement of seats provides for three or even four. There are usually two doors, and two windows on each side. The *sedan* is an enclosed car, with two seats for four, five, or seven passengers. It usually has four doors, but a special type, the *coach*, has only two. It has a permanent top and glass-enclosed sides. The *berline* is similar to the sedan, the chief difference being a partition which divides the driver's compartment from that of the passengers. The *limousine* is a closed-type body; it is without



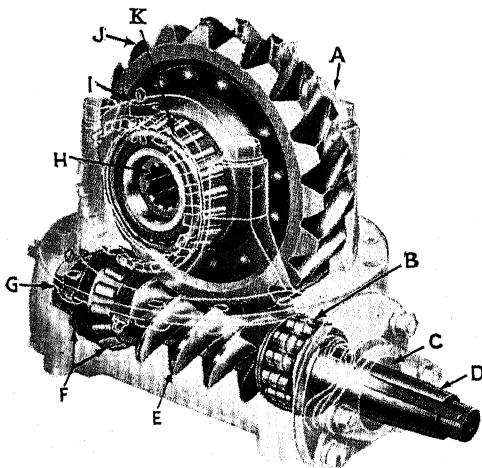
ENGINE FRONT

In the illustration the silent chains are exposed. Identification of parts follows: A, thermo-cool intake; B, camshaft sprocket; C, upper silent chain; D, automatic adjusting sprocket (upper); E, F, intake manifold; G, intake manifold heat riser; H, transfer and fan sprocket; I, carburetor; J, oil breather; K, lower silent chain; L, starting motor; M, crankshaft sprocket; N, oil pan; O, oil pump; P, automatic adjusting sprocket (lower); Q, accessory sprocket; R, distributor; S, oil rectifier; T, water outlet manifold.

windows between the rear and the driver's compartment. Other types are the *brougham*, the *landaulet*, and the *cabriolet*, all of which are similar to the limousine, with variations in the kind and amount of the enclosure of the compartments. Besides these standard types of private passenger vehicles, there are several kinds of specialized bodies for taxicabs, motor omnibuses, and sight-seeing cars.

2. Trucks and Other Commercial Vehicles.

This class includes all styles, from the small delivery wagons of the retail stores to great trucks for carrying coal, stone, and other heavy materials. The special features of these vehicles are their greater capacity, as compared with horse-drawn wagons, and the greater distance they can cover in a given time. The earliest cars were bodies of horse-drawn wagons placed on a motor chassis, but now special designs are in use for every possible purpose. Automobiles are being used for business purposes to an ever-increasing extent; the initial investment is somewhat greater than the cost of a horse and wagon, but the maintenance charge is less, and the amount of work done is much greater. A team and wagon can cover an average distance of sixteen to twenty miles a day; a small delivery automobile can cover this distance in less than an hour, and even a heavy truck can cover much more than 100 miles a day. Under the same conditions, the cost of delivering a package by automobile is



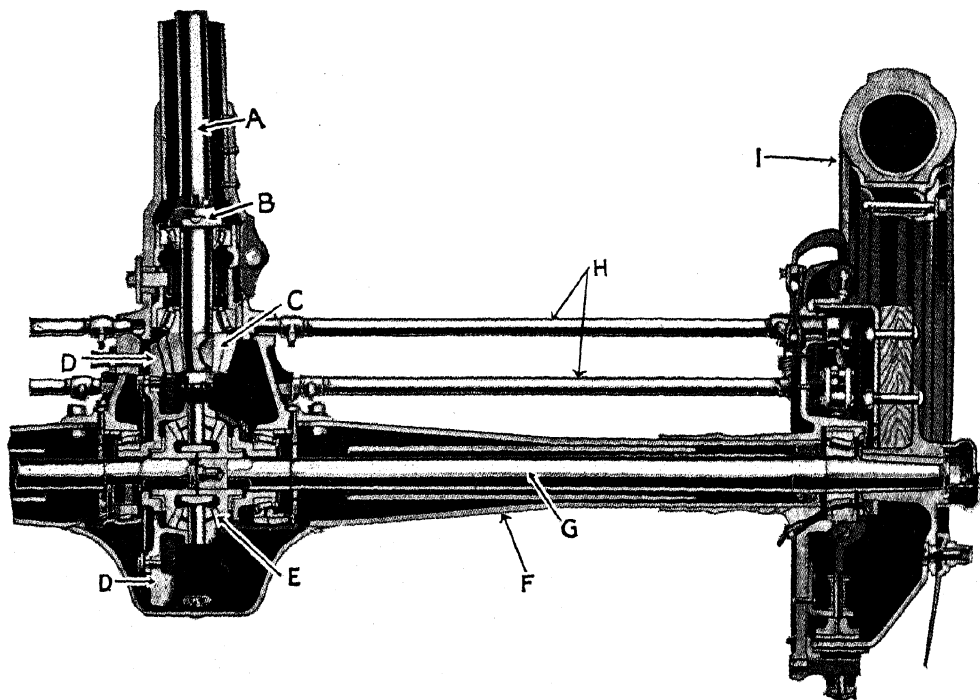
WORM AND WORM WHEEL ASSEMBLY

A, differential roller bearings; B, worm shaft forward roller bearings; C, worm shaft packing gland; D, worm shaft; E, worm; F, worm shaft rear double bearing; G, worm shaft rear-bearing nut; H, differential side gear; I, bearing lock; J, worm wheel; K, differential roller bearings.

less than one-half the cost of delivery by horse and wagon. In the large cities the automobile has almost entirely supplanted the horse for all business purposes.

Construction and Operation. When one buys an automobile, he receives with it an instruction book which explains the mechanism of the machine and how to give it the proper

Either just before or at the moment of greatest compression, the mixture is ignited, thus causing the gas to expand. The expanding gas drives back the piston, the piston com-



SECTIONAL VIEW OF DIFFERENTIAL AND REAR AXLE

A, propeller shaft; B, propeller shaft bearing-nut; C, rear axle drive bevel pinion; D, D, rear axle drive bevel gear; E, differential side gear and pinion; F, rear axle housing; G, rear axle shaft; H, (upper) outer brake operating shaft, (lower) brake shoe operating shaft; I, rear wheel.

care. If you examine one of these books, you will probably be impressed with the complicated nature of the machine, composed, as it is, of thousands of parts, many of which have unfamiliar names. Yet the operation of an automobile is comparatively simple, and an understanding of it may be gained by attention to a few fundamental principles.

A study of the illustration of the working parts of an automobile will show the many devices and members which are essential to its successful operation. The use of a number of these, such as the wheels, frame, brakes, and steering wheel, are self-evident. Hence, a detailed description of them will not be attempted. But the major units, such as the engine, the transmission, and the differential gear, which are less apt to be understood on casual inspection, will be more fully explained.

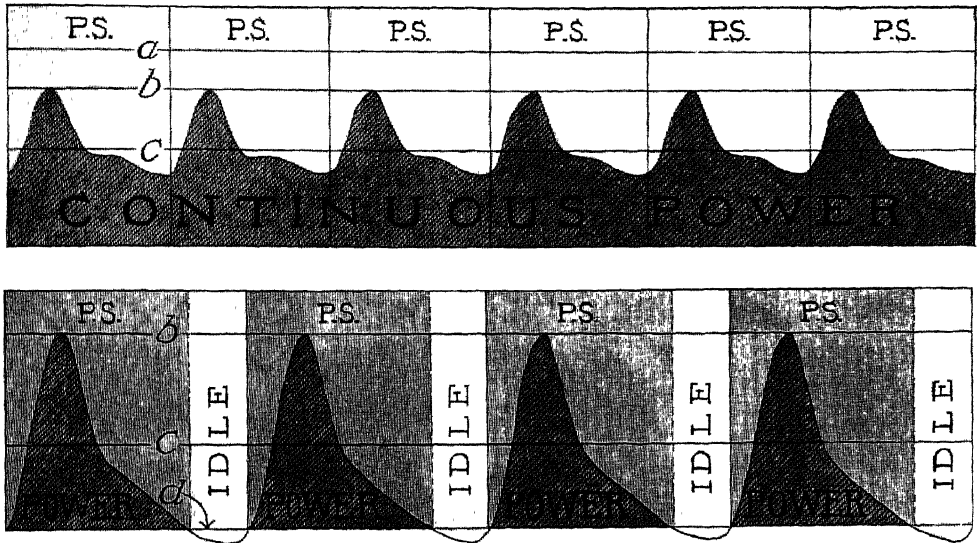
The Engine. In a gasoline engine the liquid gasoline is forced through a carburetor, which turns it into a fine spray and mixes it with air. This mixture, or gas, is drawn into the cylinder of the engine by the suction of the piston, and when the piston returns, it is compressed.

municates power to a crankshaft, and from the crankshaft through an elaborate mechanism (called the transmission) to the wheels. The first automobiles made had only one or two cylinders. Later the number was increased to four, then to six, eight, and twelve, though the last-named has been abandoned by manufacturers. Explosions in these cylinders do not take place at the same time, but one after another in regular succession. (See diagram.)

The gasoline is admitted into, and expelled from, the cylinders through openings controlled by valves, which are made to open and close by a series of cams operated by the cam shaft. The sparks for igniting the gas are supplied by a battery through a distributor, which furnishes them at the exact instant needed to fire the cylinders in regular sequence.

An inspection of the two diagrams will explain the relation of the number of cylinders to the development of continuous power.

Notwithstanding the fact that a continuous flow of power is developed by the modern gas engine, additional smoothness is obtained by attaching a flywheel to one end of the crank-



GRAPHIC COMPARISON OF POWER

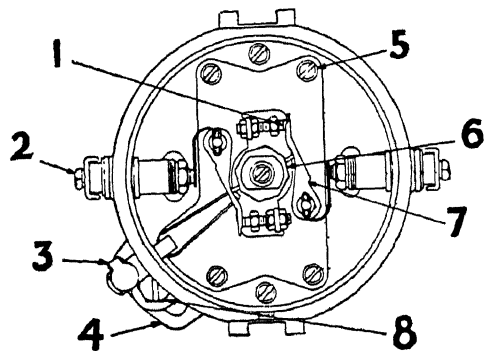
The above illustration graphically indicates the power produced by a six-cylinder and a four-cylinder engine, in form such as the average person can understand. It shows that the greatest pressure of a four is greater than that of the six; but the "six" produces continuous and more nearly constant power, whereas in the "four" high pressure is followed by a moment of no pressure at all. Shaded portion shows graphically the total pressure applied in a single cycle. Both diagrams are on same scale. *Six-Cylinder* (above): (a) highest pressure in a four whose power is equal that of a six; (b) highest pressure in the "six"; (c) average pressure; (d) variations in actual pressure; (P.S.) indicates power stroke. *Four-Cylinder* (below): (b) highest pressure; (c) average pressure; (P.S.) power stroke.

shaft. This, by its inertia, tends to equalize the fluctuations in power caused by the slight intervals between the strokes of the pistons. This use of the fly-wheel has long been known to engineers. Weights are also attached to the crankshaft, to counteract the vibrations due to its rapid rotation. The result is a quiet, smooth flow of power which has been well described as "vibrationless beyond belief."

The Transmission. Since the automobile engine operates at a relatively high rate of speed, some means had to be found to apply the power of the engine, at a reduced rate, to the driving mechanism of the car, so that the load could be picked up gradually. The first automobile had only one "speed"—the engine was connected directly to the means of propulsion. Thus it was impossible to start the car slowly. In order to move the car and its load, the start should be slow, and the speed should be increased by degrees until a normal momentum is obtained. This is accomplished by a series of sliding gears and a clutch; the latter connects the engine with the propelling mechanism. The gears operate on the principle that when two gear wheels of different sizes are engaged or meshed and caused to rotate, the larger will turn more slowly than the smaller. By adapting the size of the wheels to the requirements, any desired speeds may be obtained. In an automobile, provision is usually

made for three speeds; low, or first speed, for starting; intermediate, or second speed, for gaining further momentum; and high, or third speed, for use under all normal conditions. Occasionally a manufacturer produces a car with four forward speeds.

When the car is in "high," the engine shaft is directly connected with the drive shaft, and variations in speed are obtained by regulating



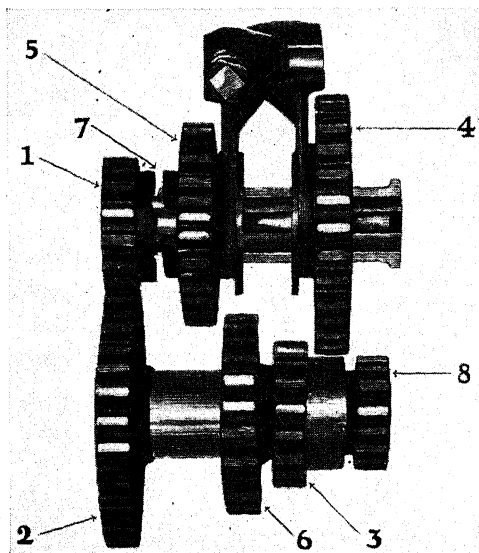
THE TIMER

1, contact points; 2, terminal; 3, oiler; 4, advance lever; 5, adjusting screw; 6, cam; 7, contact arm; 8, hold-down screw.

the amount of fuel supplied to the engine. There is also a reverse gear provided, to move the car backwards. The changing of the gears

from one speed to another is done by means of the gear-shift lever, which is moved or shifted to the different required positions.

The clutch usually consists of several plates, some of which are attached to the crankshaft,



HOW GEARS ARE SHIFTED

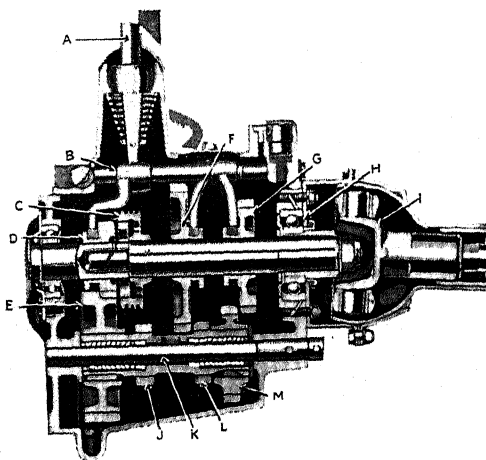
As the car gains speed and less power is required to drive it, the gear lever is shifted from low, or first speed, to the second, or intermediate speed position. Then gear 4 is moved out of mesh with gear 3 to the position shown in the illustration, while gear 5 is moved into mesh with gear 6. The power is then transmitted, on high, or third speed, through gears 1, 2, 6, and 5. To reach high, 5 is moved out of mesh with 6 and moved so the interlocking fingers (7) will engage 1.

or engine side of the mechanism; the others, operating on a clutch shaft, are connected with the drive shaft, or car side of the driving mechanism. The plates are forced together by a strong spring, which keeps them tightly bound together, unless the clutch pedal is depressed to release them. By releasing the clutch, the engine is entirely disconnected from the driving mechanism of the car.

What Happens When the Gears Are Shifted. The diagram shows two sets of gear wheels, one set mounted on the clutch shaft, the other on the countershaft. The wheels 1 and 2 are in constant mesh, so that the countershaft turns at all times when the engine is running and the clutch is engaged. In shifting to first speed, the clutch is disengaged, and gear 3 is meshed with gear 4. The clutch is then allowed to return to normal position, and the power is transmitted through 1, 2, 3, and 4. For second speed, gear 5 is meshed with gear 6. For third speed, the clutch shaft is connected directly with the engine shaft by means of gear 7, and the power passes from the engine to the drive shaft. The car is now in "high,"

or direct drive. The gears 1 and 2 are still meshed, and the countershaft continues turning, though its gears are doing no work. They are in readiness for any shift to lower speeds or to reverse. In shifting to reverse, the gears 4 and 8 are engaged; 8 is mounted on an idler shaft, and its direction of motion is opposite to that of the other gears.

The Differential. The rear axle of an automobile must provide for two things. It must transmit the power of the engine to the rear wheels, which are the driving wheels of the car; and it must permit the rear wheels to revolve at different rates of speed, since in turning a corner one wheel turns more rapidly than the other. Both these conditions are met by the differential. The rear axle is divided into two sections, each section being rigidly fastened to one of the rear wheels. In the center of the axle, where the two sections come together, each section has a bevel gear mounted on its inner end. These bevel gears do not come into contact with each other, but are separated by four cone gears, on pinions which permit them to turn. When one side of the axle revolves more rapidly than the other, the cone gears turn on their pinions enough to compensate for the difference. By this means, the speed of the rear wheels is always balanced, whether they move at the same speed or different rates of speed. This device is one of the



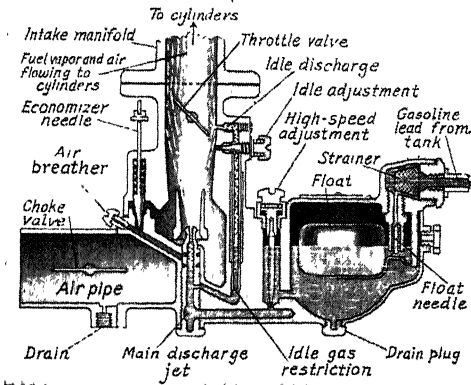
CROSS-SECTION OF TRANSMISSION

A, gear-shift lever; B, shift bar; C, high-speed internal gear; D, high-speed sliding gear; E, transmission countershaft gear; F, low and reverse sliding gear; G, second speed sliding gear; H, transmission shaft rear bearing; I, universal joint; J, L, transmission countershaft, low and reverse gear; K, transmission countershaft, second-speed drive gear.

most remarkable of mechanical inventions. It is a splendid example of the engineering skill which has made possible the automobile of to-day.

Electric Automobiles. The electric automobile owes its development to Thomas A. Edison. It differs from the steam and internal-combustion type in its essential feature; it operates with power generated elsewhere and stored in it, whereas the steam and gasoline engines themselves generate the power which runs them. The motive power in an electric automobile is furnished by a storage battery (which see), which must be recharged frequently. Places where electrical energy can be easily obtained are usually limited to cities, and a single charge is sufficient for only sixty to 100 miles. The speed of an electric automobile is less than that of the gasoline type; it seldom exceeds fifteen to twenty miles an hour. Owing to high maintenance charge, the electric automobile has entirely lost its popularity.

The Automobile in War. Along with its increasing usefulness in peace has been the development of the automobile for military



THE CARBURETOR

purposes. In a small way motor vehicles had been used by the British in the South African War (1899-1902), by the Italians in Tripoli in 1912, and by the Bulgarians in the Turko-Balkan War in 1912-1913; but it remained for the World War in 1914 to demonstrate that the automobile, perhaps more than any other single weapon of offense or defense, has entirely changed the character of war.

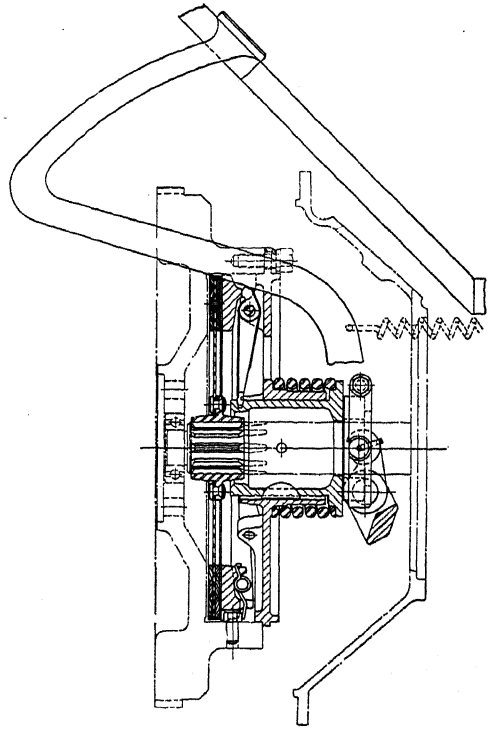
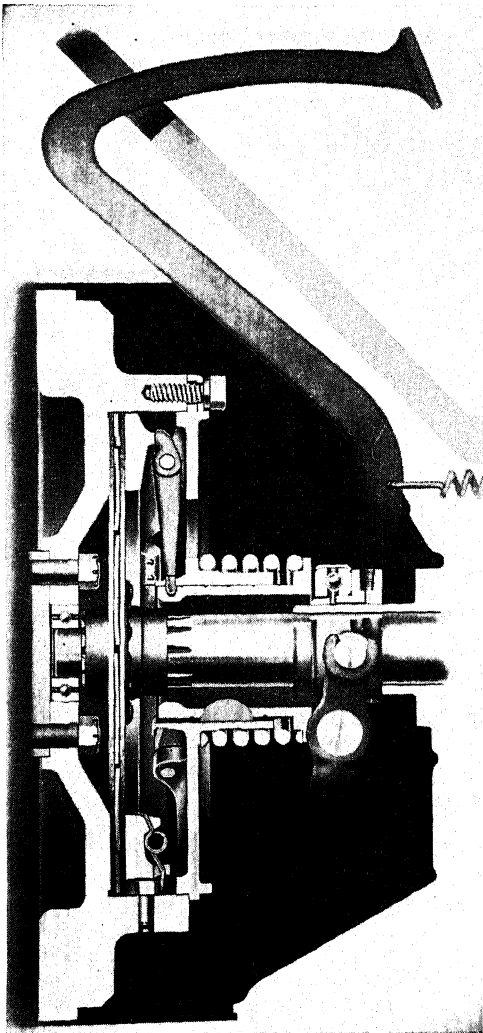
When Napoleon once remarked that an army fights on its stomach, he meant that its movements are dependent on the mobility of its food supply. Once it was of frequent occurrence for an army to wait for its supply trains, and Frederick the Great is known to have altered his plan of campaign on several occasions in order that his troops might keep close to their food supplies. Now it sometimes happens that the motor-transport trains wait for the army, and rare are the instances in which food and ammunition fail an army because of poor transportation.

The automobile has made possible the rapid movement of men and supplies on a scale hitherto believed impossible. It has brought tons of food and ammunition to millions of men under circumstances in which horses could have brought only pounds to thousands. It has made possible more rapid attacks and retreats, and has unquestionably brought death to added thousands of men. On the other hand, it has saved thousands of lives, for men who otherwise would have lain on battlefields for hours or days have been transported speedily to hospitals far from the firing line. Within ten days after the World War opened, the nations under arms were using over a quarter of a million automobiles in the field, and the number constantly increased as fast as factories in Europe and in the United States and Canada could finish new ones.

They were used for every conceivable purpose; everything movable was moved by gasoline, if possible. There were light scout-cars, and heavy armored cars, ambulances, repair-shops, and gasoline tanks on wheels. There were motor kitchens, motor operating rooms and hospitals, and giant tractors drawing siege guns or supply wagons by the score. There were automobiles carrying machine guns, airplane guns, or heavy artillery, and others which were really small forts mounted on wheels. In place of the brave courier who rode a breathless horse, the dispatch carrier rode in a puffing automobile. From generals to privates, the whole army rode in automobiles when speed was necessary, and the horse almost completely disappeared from the battlefield and its surroundings. France credits the automobile with the defeat of the first German "drive" upon Paris in September, 1914, when in a single night 60,000 troops were transferred by motors from Paris to the battlefield, forty miles distant, to oppose the invaders at a critical point at sunrise.

Late in 1916 the British forces in France surprised their German foes by producing great armored tractors, weighing over 20,000 pounds and heavily armed, which could travel on "caterpillar" wheels over destroyed trenches and broken walls. Machine-gun and rifle fire seldom injured the occupants. These machines were known as "tanks."

Automobile Racing. For the purpose of testing various features of design and subjecting cars to unusual strains, manufacturers have developed racing cars. They are usually smaller and lighter than standard automobiles, and are designed to offer the least possible resistance to the air; they are narrow in proportion to their length, and carry nothing which will add superfluous weight. Race meets have been a regular feature since the automobile was first invented. The two most important events in former years were the



THE CLUTCH

In position for driving, as shown at left. When the foot lever is depressed, the clutch disengages the motor from the driving gears.

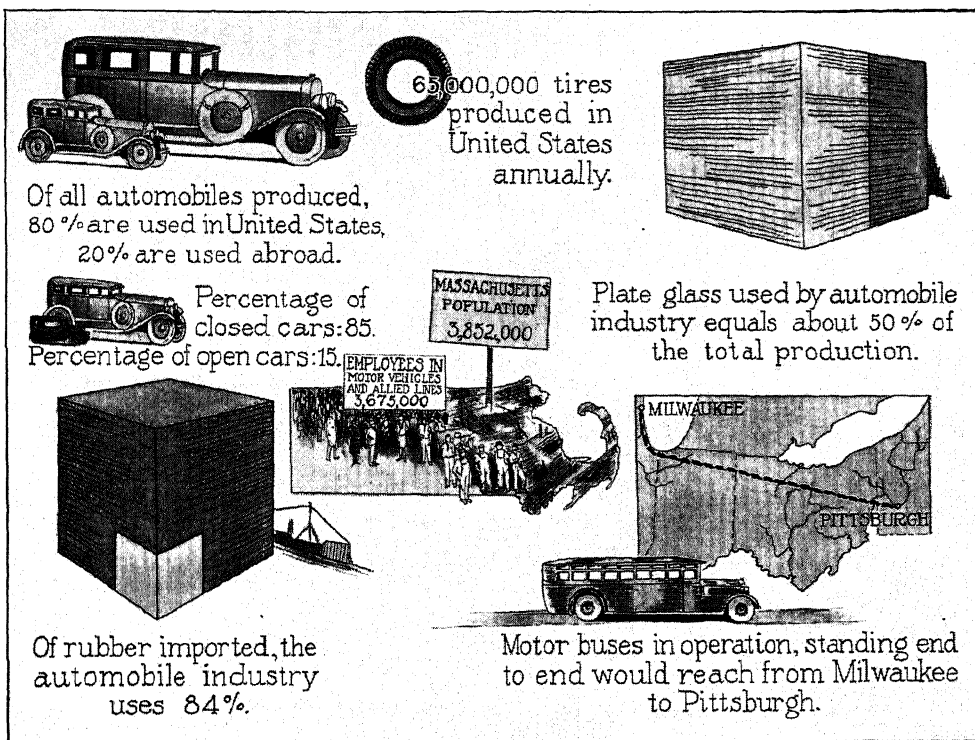
annual races for the Vanderbilt Cup in New York and for the Grand Prize of the automobile clubs, the former usually at 300 miles and the latter at 400 miles. Later, Indianapolis built what was at the time the greatest speedway in the world, on which 500-mile races are run regularly every year on Memorial Day. Chicago followed with a similar speedway in 1915, but this was later abandoned. There are notable courses in Florida and California.

The world's record for speed in an automobile was made by Major H. O. D. Segrave of England at Daytona Beach, Fla., March 29, 1927. He drove a Sunbeam racing car at an average speed of 203.79 miles an hour. The fastest previous time was made by Tommy Milton in 1920 over the same course, his record being 156.04 miles per hour. The highest average for a distance over 100 miles was made at

Indianapolis in 1925, when the winner of a 500-mile race finished in four hours fifty-six minutes thirty-nine seconds, an average of more than 101 miles per hour.

The Automobile Industry. It hardly seems possible that in little more than twenty-five years the manufacture of automobiles should become the foremost industry in the United States; yet such is the fact. The present output of more than four billion dollars' worth of cars per year puts this industry in first place among the productive industries of the present day. There are now more than twenty-three million cars in the United States, or one to every family, and ten per cent of the families owning cars have more than one. Canada registers nearly a million cars every year; Great Britain and Ireland, somewhat over one million; France, about 900,000; Germany, 350,000; Japan, 50,000; Russia, 20,000.

The owners of all motor vehicles must register them in the office of a designated official, and pay a license fee for the privilege of operating a car on the public highways. The fee is based on the horse power of the engine and the use for which the vehicle is intended. The income from licenses to the various states in the United States exceeds



THE COMMANDING PLACE OF THE AUTOMOBILE IN INDUSTRY

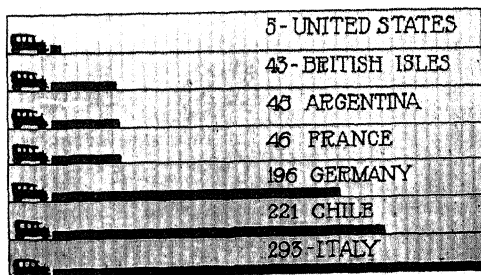
\$300,000,000 a year. This money is used for building permanent roads. Additional revenue for road-building is obtained from a tax on the sale of gasoline in nearly ever state; this amounts to about \$415,000,000 a year.

The average cost of the operation of a motor car weighing 3,000 pounds is ten cents per mile, including maintenance, depreciation, interest, insurance, garage, and license fees. The average expense for the replacement of

The industry employs not far from four million persons, and produces approximately four million cars per year. The amount of material used in the manufacture of these cars is astonishing. Eighty per cent of all the plate glass produced in America is used in American-made automobiles; sixty-three per cent of all the upholstery leather; eighty-five per cent of the consumption of crude rubber; and twenty-five per cent of all the aluminum products are used in automobile construction. The amount of paint and varnish used is more than four million gallons; and the gasoline required to keep all the cars running reaches the enormous total of twelve billion gallons a year.

These figures show the widespread popularity and universal use of the automobile. They indicate why streets are blocked by the parking of cars, why highways are congested with traffic, and why all communities are demanding good roads.

The traveler who sets out on a journey by automobile to-day will find paved highways in nearly all parts of the country. He will find these roads marked by a Federal system of numbers which will enable him easily to find his way. He will find gasoline stations on nearly all important corners, lunch stands

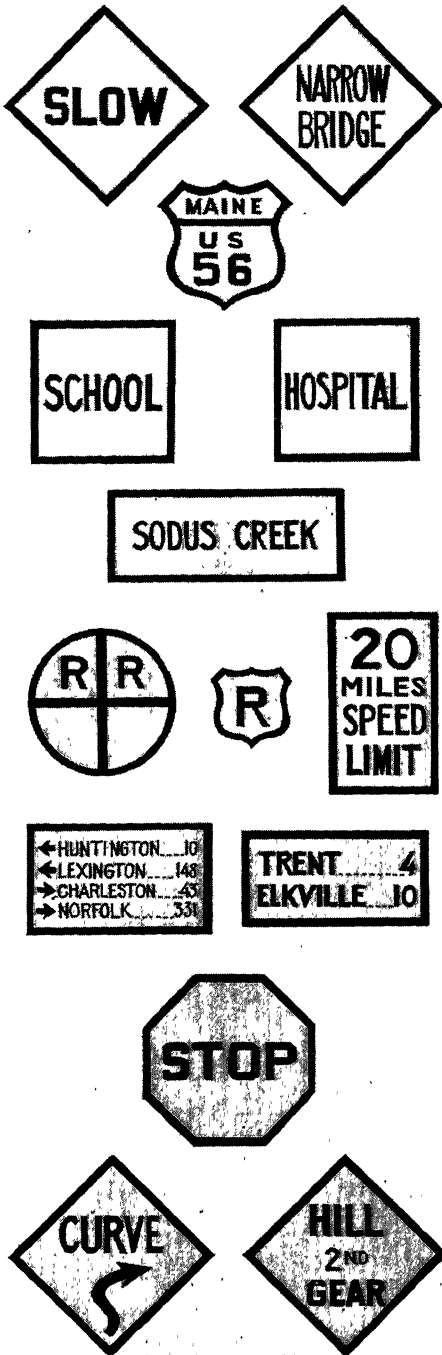


AUTOMOBILE OWNERSHIP

The diagram shows the number of persons (not families) to each automobile in leading countries.

parts, tires, and for fuel and lubricants varies from \$35 to \$220 annually, depending upon the type of car.

Standard Highway Markings For All States



everywhere available, and hotel accommodations ample for his entertainment. He will find himself able to make a trip of some hundreds or thousands of miles in comfort, and at a reasonable cost; and on his return, he will probably think so little of it that he will mention it only casually to his friends as if it had been the most ordinary occurrence. Truly, the "magic carpet" of the Oriental tale is far outdone by the efficient, luxurious automobile of to-day. L.W.S.

Related Subjects. The reader is referred in these volumes to the following subjects.

Carburetor
Gas Engine

Standardization in Industry
Transportation

AUTOMOBILE GAS POISONING. See ANTIDOTE (Carbon-Monoxide Poisoning).

AUTONOMY, *aw tahn' o mie*. Any state or community that governs itself is said to enjoy *autonomy*. Particularly, the term applies to the free right of a country to manage its own affairs while it is under the nominal political control of another country. Northern Ireland is a good example of a state enjoying autonomous government within an empire. Its Parliament has power to legislate for its own area in matters of local import, but in regard to peace and war, military and naval affairs, and foreign relations, the country is subject to the British Parliament. The relation of the various states of the American Union to the Federal government illustrates the same principle; each state is free to manage its own affairs, but interstate affairs are under control of the national government.

Derivation. The term *autonomy* is derived from two Greek words meaning *self* and *law*.

AUTO-SUGGESTION. See SUGGESTION, subhead.

AUTUMN FIRES (poem). See LANGUAGE.

AUX CAYES, *o ka'*, a town in Haiti (which see).

AVALANCHE, *av' a lanch*, the name given to masses of snow or ice that rush down mountain sides. They travel with great force and destroy trees, buildings, men, animals—everything in their path. When in winter the mountain sides become overloaded with fine, dry snow, these great snow caps may be started to lower levels by strong winds. They are known as *wind avalanches*. *Ice*, or *summer avalanches* are great masses of ice detached by thawing from the high glaciers, and they occur in the warmest season. *Sliding avalanches* are masses which become too heavy for their support and, breaking away, crash to lower levels. Avalanches, also called *landslides*, which occur in summer are sometimes composed of melting snow and large areas of loosened earth.

All avalanches take place so quickly that people seldom have time to get out of their



AVE MARIA

From the painting by Wellington J. Reynolds

way. Especially fatal are those that plunge over high cliffs into valleys below. Sometimes the descending mass weighs from 100,000 to 200,000 tons.

R.H.W.

Derivation and Figurative Use. The word *avalanche* is from a French idiom, *avalanche*, and means *descent*. It is widely used in a figurative sense to indicate a mighty force which one cannot withstand. Thus, it is proper to say, "An *avalanche* of words silenced his opponents." One should guard against using the term when it exaggerates the facts.

AVALANCHE LAKE. See GLACIER NATIONAL PARK.

AVE MARIA, *ah' vah mah ree' ah* (Latin *Hail Mary*), in the Roman Catholic Church is a form of prayer expressing honor to the Virgin and asking her intercession. The words are chosen from the beginning of the angel Gabriel's salutation to Mary, *Hail, full of grace, the Lord is with thee* (Luke I, 28). The prayer has been set to music by a number of famous composers, among them being Liszt, Schubert, and Gounod, the composition of the last-named being the one most frequently sung.

AVERNO, LAGO D', an Italian lake, famed in the days of mythology as Avernus (which see).

AVERNUS, *a vur' nus*, a lake occupying an extinct crater in Campania, Italy, about eight miles west of Naples, bearing the modern name of Lago d' Averno. According to mythological lore, it formed the entrance to the lower regions, through which Aeneas and Ulysses descended, and through which Pluto carried Proserpina, his stolen bride. In former times it was gloomy and forbidding, surrounded by dense forests and covered with a column of sulphurous vapor which was said to destroy all birds attempting to fly over its waters. In consequence of this belief, the Greeks called the lake *Aornis*, a word meaning *without birds*. The lake is about two miles in circumference, with a depth of 180 feet, and its neighborhood is now bare and desolate.

Related Subjects. The reader is referred in these volumes to the mythological personages named above.

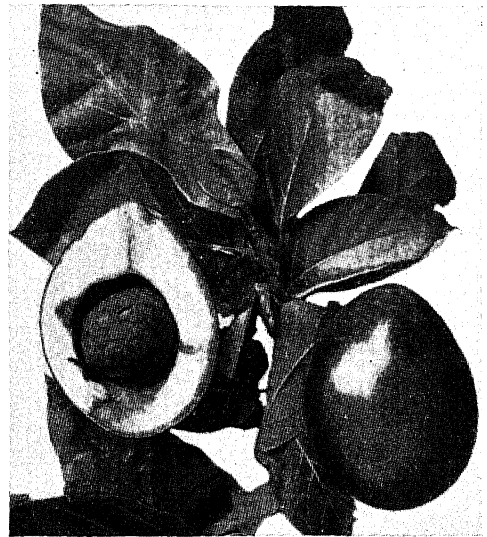
AVES, *a' veez*. See ZOÖLOGY (Divisions of the Animal World).

AVIATION, *a vi a' shun*. See AIRCRAFT.

AVOCADO, *av oh kah' doh*, OR **ALLIGATOR PEAR**, a tropical fruit borne by a beautiful evergreen tree of the laurel family. This tree grows wild in Mexico and Central America, and has been introduced into various other tropical countries. It is extensively cultivated in California, Florida, and Hawaii, since there is a substantial demand for the fruit in American markets.

The avocado (its correct name) is round, egg-shaped, or oblong, and in diameter varies from one inch to six inches. Large-sized

fruits weigh as much as four pounds. The yellowish-green pulp, in which is embedded a large, round kernel, is butterlike in consistency, and has a flavor suggesting nuts. It is



THE AVOCADO

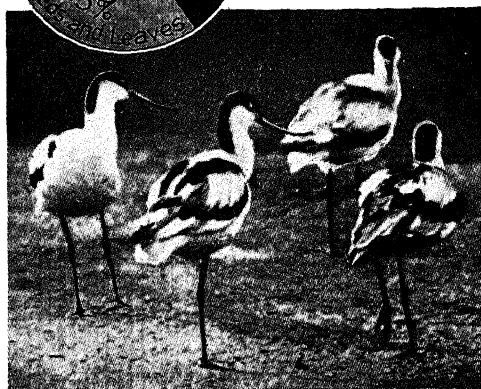
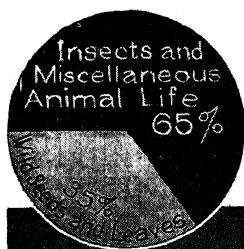
The illustration shows the whole fruit and foliage, and also the fruit halved.

very nutritious, as twenty per cent of its content is fat. Sailors call it "midshipman's butter." It may be eaten with sugar and cream, or as a salad, with dressing. The natives in the tropics often serve the avocado, seasoned with salt and pepper, as the chief dish of a meal.

B.M.D.

Scientific Name. The avocado belongs to the family *Lauraceae*. Its botanical name is *Persea gratissima*.

AVOCET, OR **AVOSET**, *av' o set*, a long-legged wading bird belonging to the same family as the stilts, and related to the snipes and sandpipers. The American avocet is found in greatest numbers west of the Mississippi River, from Southern Canada to the Mexican border. In winter, the birds move southward, some reaching Guatemala. The avocet may be recognized by its long, flattened bill, which is broad at the base and curved upward at the tip. The bird is about seventeen inches long. The general color of the body is white, the wings being black, but in the breeding season the head and neck are streaked with cinnamon-brown. Avocets lay three or four spotted eggs. They seek their food in shallow pools, where they can dip the head down and sweep the bill along the bottom for aquatic animals. They also take matter floating on or in the water. As they are harmless and eat some injurious insects, they



THE AVOCET

This bird has a larger body and shorter legs than the stilt. The approximate choice of food of the avocet is shown in the circle.

Scientific Name. Avocets belong to the family *Recurvirostridae*. The American species described above is *Recurvirostra americana*. There are several Old World species.

Related Subjects. The reader is referred in these volumes to the following articles:

Bird (Government Protection)	Snipe
Sandpiper	Stilt

AVOIRDUPOIS, *av ur du pois'*, a system of weights used for all ordinary coarse articles of commerce, such as coal, grain, foodstuffs, and the like. A pound, avoirdupois weight, contains 7,000 grains, divided into 16 ounces, each ounce having 16 drams, while the troy and apothecary weights contain 5,760 grains, or 12 ounces. The latter two are used in weighing precious metals, gems, and medicines. In the two kinds of weights the grain, the basis of computation, is unvarying. See **DENOMINATE NUMBERS**; **POUND**; **APOTHECARIES' WEIGHT**.

Derivation. The word *avoirdupois* is derived from the French language, and means *goods of weight*.

AVON, *a' von*, **RIVER**, a waterway in England, made famous through its connection with the greatest name in the world's literary history—that of Shakespeare, whose birthplace was at Stratford-on-Avon. There are in England several small rivers called Avon, but the world is interested chiefly in this one, known as the Upper Avon. This stream, ninety-three miles in length, rises in Northamptonshire, flows through one of the most beautiful valleys

deserve the protection afforded by the Migratory-Bird Treaty Act, the regulations of which are now extended to them. D.L.

in all England, and falls into the Severn at Tewkesbury. See illustration, in article **SHAKE-SPEARE**.

AXIOM, *ak' sih um*, in mathematics, a proposition the truth of which is accepted without proof. In a more general sense, we apply the term to established principles that are universally accepted, such as the axioms of international law.

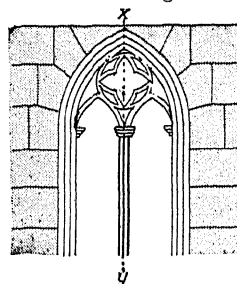
Among the axioms recognized by Euclid as the basis for geometry are the following:

(1) If equals be added to equals, the sums are equal.

(2) A whole is greater than any of its parts.

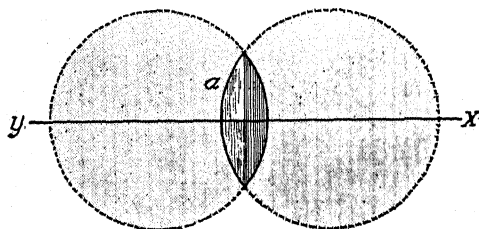
(3) Things equal to the same thing are equal to each other.

(4) Magnitudes which coincide are equal to each other in every respect. See **GEOMETRY** (Terms Used). J.W.Y.



$x y$ is axis of arch.

AXIS, *ak' sis*, a term used in astronomy, botany, anatomy, and mathematics. It is a real or imaginary straight line passing through a



$x y$ is axis of prism a .

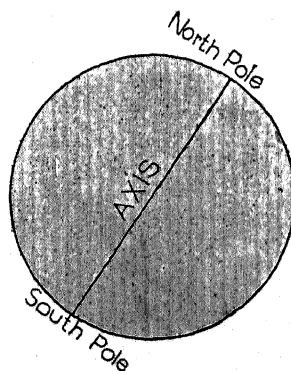
body or magnitude, on which the latter revolves, or may be supposed to revolve.

In *astronomy*, the word is used to indicate the center around which the earth rotates. The axis of the earth has for its two extremities the North Pole and the South Pole.

In *botany*, the word reappears, the plant stem being termed the *ascending axis*; the root, the *descending axis*.

In *anatomy*, the name is given to the second vertebra from the head, that on which the *atlas* moves (see **SKELETON**).

In *mathematics*, an axis is the straight line about which the parts of a figure or body are symmetrically arranged.



AXON, *ak' son*. See NERVOUS SYSTEM (Structure of Nerve Tissue).

AYE-AYE, *i' i'*, a mammal of the lemur group, found in Madagascar. It is so named, some authorities declare, from the cry of sur-



THE AYE-AYE

prise which the natives give when they see the animal; others believe the name is derived from the animal's own cry. The aye-aye is about as large as a rabbit, and though a close relative of the monkey, resembles the squirrel in some particulars, especially in respect to its long, strong teeth and its bushy tail. It has large eyes and ears, and is brown in color. Its most peculiar characteristic is a long, narrow third finger, with which it is thought to drag insects from their burrows. Like many others of its order, it is a creature of the night. Its nest of twigs is built in a high tree in the densest part of the jungle. See LEMUR.

M.J.H.

Scientific Name. The aye-aye is the only representative of the family *Chiromyidae*, which forms with the family of lemurs the suborder *Lemuroidea*. Its specific name is *Chiromys madagascariensis*.

AYERS PENMANSHIP SCALE. See EDUCATION (Measuring Results of Education).

AYLESWORTH, *aylz' wurth*, SIR ALLEN BRISTOL (1854-), a Canadian lawyer and Liberal statesman, one of the leading authorities on electoral and constitutional law in the Dominion. He was born at Newburgh, Ont., attended Newburgh Academy and the University of Toronto, from which he was graduated in 1874, and was called to the bar in 1878. He soon became a prominent lawyer, and on numerous occasions appeared in cases of great importance, notably in 1904, when he successfully represented the old provinces of the Dominion during an attempt to reduce their representation in Parliament. In 1903 he was one of the commissioners appointed to settle the Alaska boundary dispute, and together with Sir Louis A. Jetté refused to sign the award. In 1910 he prepared the case for the British dependencies in the Atlantic fisheries arbitration by The Hague Tribunal, and as a reward for these services was created K.C.M.G. Meanwhile, in 1905, he was elected to the Do-

minion House of Commons, and was at once appointed Postmaster-General in Laurier's Ministry. He acted as Minister of Justice from 1906 to 1911, and was appointed to the Canadian Senate in 1923.

AYR. See SCOTLAND (The Cities).

AYRSHIRE, *air'shir*, COWS. See DAIRYING (The Herd); CATTLE.

AZALEA, *a za' le ah*. The name azalea is properly a popular name only. It applies to certain of the flowering shrubs now included in the genus *Rhododendron*. Horticulturists place the azaleas in a separate genus, including in the latter group only those plants with deciduous foliage, that is, leaves that fall in the autumn. This distinction, however, is purely arbitrary. The azaleas are shy woodland plants, distinguished by their showy, trumpet-like flowers, which usually have an extremely pleasant scent. Their colors range through all shades of pink and red; and white, yellow, and purple azaleas are by no means uncommon.

Azaleas furnish a most interesting example of the way in which nature adapts means to



Photo: Visual Education Service

AZALEA

an end. That the flowers may be fertilized, bees and butterflies must visit them, and honey is provided to attract them. But ants, which are of no help in distributing pollen, like honey, too, and that they may not steal it, many of the azalea blossoms are provided with sticky hairs, past which these invaders cannot crawl. See RHODODENDRON; CHARLESTON, S. C. B.M.D.

Scientific Name. The azaleas belong to the heath family, *Ericaceae*. The pink azalea, wild honeysuckle, or pinxter flower, as it is variously called, is

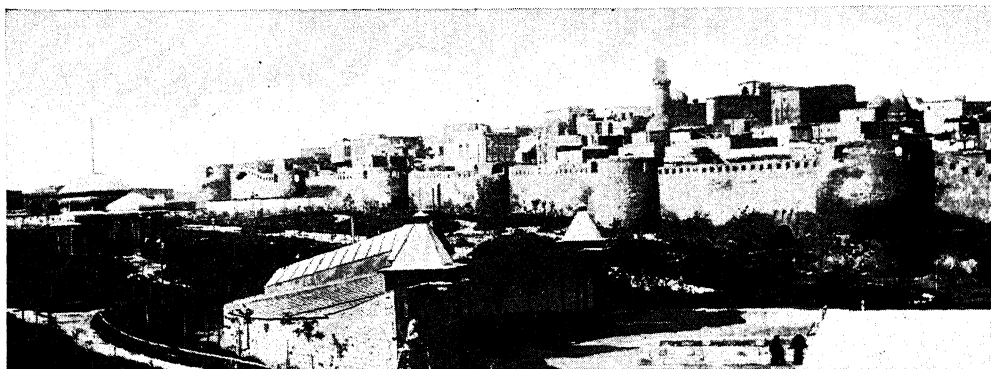


Photo: Keystone

VIEW OF THE CITY OF BAKU

The photograph was taken just before a portion of the encircling wall was torn down. Beyond the hill on which a part of the city stands is the shore of the Caspian Sea.

one of the best-known and most beautiful species. Its scientific name is *Rhododendron nudiflorum*, or *Azalea nudiflora*.

AZAZEL, a za' zel. See SCAPEGOAT.

AZERBAIJAN, ah jur bah e jahn', one of three republics formed from the former Russian province of Transcaucasia. It became independent upon its organization in 1918, with recognition by the great powers, but in 1920 it embraced bolshevism, and in the same year joined Armenia and Georgia in the Transcaucasian Federation of Soviet Republics. In a short time, this group became one of the integral parts of the Union of Soviet Socialist Republics, by which name Russia is now known.

Azerbaijan extends from the Caspian Sea westward to a point nearly midway between that body of water and the Black Sea. Its boundaries are quite irregular; the area is 33,640 square miles, less than that of Ohio, but if the

the country. If the field were properly managed, the whole of Europe could be supplied with petroleum from Azerbaijan for many years.

The Capital City. The republic has one great city, Baku, the capital and the center of the petroleum industry. So productive is the region surrounding the city that its oil industry places the Russian Soviet Republic, of which Azerbaijan is a part, third in importance among the countries of the world in petroleum output. The city of Baku was built over an oil deposit; a part of its ancient wall has been torn down in order that wells might be drilled on the location. There is a possibility that the town may be abandoned gradually and relocated on a new site, so that the oil beneath it may be reached. Population of the city, 452,000.

R.H.W.

Related Subjects. The reader is referred in these volumes to the following articles:

Armenia	Russia
Georgia (country)	Transcaucasian Socialist
Protectorate	Soviet Republic

AZIZIA, a ziz' i ah, a station in Jefara, North Africa, that is believed to hold the world's record for heat. See TEMPERATURE.

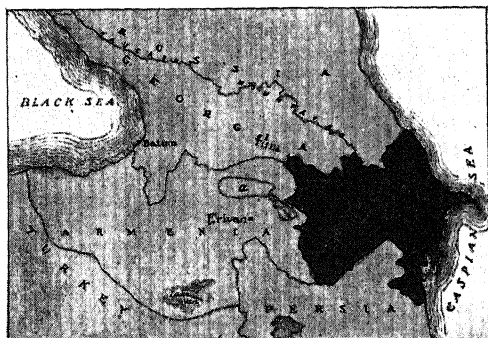
AZOIC, a zo' ik, **ERA**, in the classification formerly in vogue but now obsolete, that part of geologic time extending from the first solidification of the earth's crust to the beginning of the Paleozoic Era. It includes both the Archeozoic and the Proterozoic eras of modern classifications, and is equivalent to what is often more simply called *Pre-Cambrian time*. The word *azoic* is of Greek derivation and means *without life*, and it was used when geologists supposed that life did not appear until the Cambrian Period, a supposition now known to be incorrect.

L.LaF.

Related Subjects. The reader is referred in these volumes to the following articles:

Algonkian System	Geology
Archeozoic Era	Proterozoic Era

AZORES, a zorz', OR **WESTERN ISLANDS**, a group of nine rocky and lofty islands in the North Atlantic Ocean, an integral part of the



THREE NEW NATIONS

Within Armenia and near the boundaries of the other two countries lies a neutral zone (a).

territory over which it exercises a protectorate be included, it has a total of about 58,000 square miles. The population is estimated at nearly 2,100,000. The chief source of wealth lies in a very rich oil field within the limits of

republic of Portugal. They are farther from a continent than any other group of islands in the Atlantic Ocean, the African coast being 900 miles to the east and Newfoundland more than 1,000 miles to the west. The capital city, Angra, on Terceira island, is a regular port of call for steamers on the southern routes of the North Atlantic, and southern lines of cable between Europe and America touch the islands. At Angra resides the Governor-General of the islands, who receives his appointment and authority from Lisbon. Population, 235,000.

The volcanic origin of the group is proved by numerous hot springs and frequent earthquakes, which occur even in modern times. The hills and valleys are clothed with luxuriant vegetation, and cornfields, vineyards, lemon and orange groves, and rich open pastures are found wherever the land has been cleared of timber. The climate is mild and somewhat humid; but as a winter resort, the islands are very popular.

The Azores were discovered by Cabral about 1431, shortly after which date they were taken possession of and colonized by the Portuguese. When first visited, they were uninhabited and had scarcely any animals except birds, particularly hawks, called in Portuguese *açores*, to which the islands owe their name.

AZOV, a *zawf'*, SEA OF, a large inland sea, which the Strait of Kertch connects with the Black Sea, of which it forms an arm. About 200 miles long and 100 miles wide, it covers approximately 14,500 square miles, or an area two-thirds that of Lake Michigan. Its greatest depth is fifty-three feet. Its western end, called the Putrid Sea, is separated from the main expanse by a long, sandy belt called *Arabat*, along which runs a military road. Numerous storms, its shallowness, and ice in winter render navigation dangerous.

AZTEC, *az' tek*, the name of a nation of Indians which built up in the southern part of the North American continent a moderate degree of civilization centuries before the white man made a settlement there. Their name in their own language means *heron clan*.

When Cortez (which see) reached Mexico early in the sixteenth century, he found that all the southern tribes had been made subject to the Aztecs, who ruled from their central city, Tenochtitlan, now the City of Mexico. One of their deities, Quetzalcoatl, whose appearance on earth they constantly expected, was supposed to be a "fair god," and when this first white man, Cortez, came, they showed a readiness to worship him. But they speedily found that he had come not as a beneficent god but as a conqueror, and under their ruler, Montezuma, they offered a stubborn, though vain, resistance. In 1520, the tomb of the last Aztec emperor, Cuauhtemoc, was discovered. Cortez caused his death in 1521.

The Aztecs, of whose origin nothing is known, seem to have lived in Mexico from the twelfth or thirteenth century. They learned much from the Maya Indians of Yucatan, but they developed many features of civilized life. They showed a considerable knowledge of agriculture, architecture, sculpture, and various useful arts. Maize and the agave were cultivated, and their feather work, weaving, and pottery showed a high degree of skill.

For the purpose of recording events, they used a complicated picture-writing, and they had a lunar calendar of unusual accuracy.



AZTEC CALENDAR STONE

Their temples, much like the Pyramids of Egypt in form, were in charge of a numerous priesthood, for the Aztecs were very religious. This, indeed, was the basis of their worst fault, for their religion demanded of them human sacrifices, and each year thousands of slaves or prisoners of war were put to death with the most incredible cruelty. Excavations in Mexico have brought to light evidence of a civilization far back of the Aztec.

To-day there are living in the villages about the City of Mexico many thousands of descendants of these Aztecs, who have lost the civilization of their ancestors but stubbornly refuse to acquire new ways from their European neighbors, the Spanish conquerors. The present-day Aztecs are a harmless, timid people.


In Literature. Lew Wallace's *Fair God* deals somewhat inaccurately with the legends about Quetzalcoatl. Prescott's *Conquest of Mexico* tells the absorbing tale of the conquest, although it exaggerates very greatly the development of Aztec civilization.

Related Subjects. The reader is referred in these volumes to the following articles:

Cortez Maya Montezuma

AZTEC RUIN NATIONAL MONUMENT.
See NEW MEXICO (National Monuments);
MONUMENTS, NATIONAL.

THE WORLD BOOK

MODERN  PICTORIAL
ENCYCLOPEDIA
COMPREHENSIVE

Bb

B, the first consonant and second letter in all alphabets which may be traced back to the Phoenician. Its



name in the Phoenician alphabet was *beth*, which meant *house*, and in its form it suggested a crude picture of a house, with one side left open as a doorway. Gradually, as it was adopted by the Greeks, it was turned about, its straight lines were softened to curves, and it became the familiar capital B. This letter, pronounced chiefly by the lips, is distinguished from *p* in that both the voice and the breath are used in producing it. Sometimes the *b* of one language is replaced by *p* in a related language, especially when it is the last letter of a word or syllable.

BAAL, *ba' al*, a Hebrew word meaning *lord*, has been applied to a great many different heathen gods. The people of Canaan and Phoenicia gave its name to various local gods, adding the name of a locality to show what particular Baal was meant. Thus, there was a Baal of Tyre, of Sidon, of the Lebanon, etc. Sometimes a Baal was distinguished by some special quality, as Baal-zebub (the fly-god), whom the Philistines worshiped. While there were as many Baals as there were towns or places of worship, a few Baals became very important, especially the Baal of Babylonia, more commonly known as Bel. When the Hebrews settled in Canaan, they took up the worship of the Baals, and even gave the name to Jehovah. It was this corruption of the true worship that aroused the anger of Elijah and the prophets who followed him. Consult a *Concordance to the Bible* for references.

BABBITT METAL, a special metal used to line the bearings of journals, cranks, and axles, to reduce friction and keep the supports from becoming too hot. It is an alloy of copper, antimony, and tin, the latter being found in greatest proportion. The alloy consists of soft metal in which hard pieces of antimony are embedded. As the machinery in which it is used revolves, the softer material of the bearing is worn away at the surface, and the shaft comes in contact only with the hard metal,

which remains smooth. The name of the alloy is derived from that of its inventor, Isaac Babbitt, a goldsmith of Boston, Mass. The process of replacing the alloy is called rebabbitting.

T.B.J.

BABCOCK TEST. See MILK, subhead.

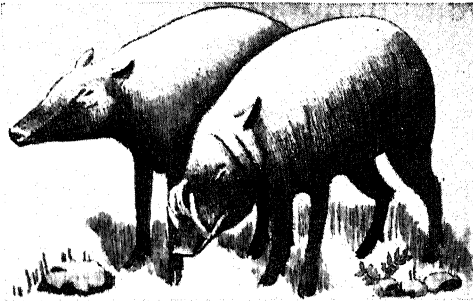
BABEL, *ba' bel*, TOWER OF, the place where the confusion of the tongues of mankind took place, as related in *Genesis xi*. In this story, the descendants of Noah, after the Deluge, wandered to the plain of Shinar, in Mesopotamia, and began to build a tower which should reach to heaven; but Jehovah caused their "speech to be confounded," so that no man understood his neighbor, and the work was left unfinished. The word *babel* has been adopted into the English language to express a confusion of sounds, but it means *gate of God*, and not *confusion*, as is usually supposed. The Tower of Babel has been identified with the great temple of Belus (or Bel), one of the important buildings of ancient Babylon. See DELUGE.

BAB-EL-MANDEB, a strait connecting the Red Sea with the Arabian Sea and the Indian Ocean, and separating the Arabian peninsula, at the extreme southwest, from the continent of Africa. The shore rises high on both sides, for on the east the strait is bordered by the cape of the same name, 865 feet in altitude, and on the west by the steep African coast, reaching its highest point 400 feet above the

sea. An island in the strait divides it into two channels, of which the one on the east, two miles wide, affords the better anchorage.

Derivation. The name *Bab-el-Mandeb* means *gate of sorrow*, and was applied to the strait because it was a dangerous channel in the days of small sailing vessels.

BABIRUSSA, OR BABYRUSSA, *bab i roo'-sah*, a Dutch word meaning *pig deer*, is the Malay name for the wild hog which inhabits Celebes, Buru, and other East Indian islands. It has a rough and nearly naked skin, and does not root in the ground as do other members of its family, but feeds upon fallen fruit and vegetables. The male is remarkable for the curious



BABIRUSSA
Male and female.

growth of its upper canine teeth, which extend upward through openings in the skin on each side of the snout and curve backward nearly to the eyes, then downward and forward again. The flesh is highly esteemed by the natives, and is said to be more delicate in flavor than pork. In some sections of its range the animal is nearly exterminated. W.N.H.

Scientific Name. The babirusa belongs to the family *Suidae*. Its scientific name is *Babirusa alfurus*.

BABISM, *bahb' iz'm*, a comparatively new religion, practiced by a Persian sect. It was founded by Mirza Ali Muhammad ibn Radhik, about 1830, and has for its basis a new interpretation of the Koran (which see). Intense opposition was met; in 1850 the leader was executed, but the cult survived. The essence of babism is a movement away from orthodox Mohammedanism. Individual existence the babists regard

as originating in a supreme deity, by whom at some future time it will be resorbed. Moses, Christ, and Mohammed are held inferior to Bab, the name given to the founder.

BABOON, an ape distinguished by its dog-like muzzle. There are about a dozen species, all but one of which are found in Africa and Arabia. A smaller species, native to Celebes, is the one usually seen in captivity.

Baboons are among the most repulsive of the monkey tribe in appearance and habits. Their four legs are nearly equal in length, and are all used in walking; in fact, it is difficult for a baboon to hold itself upright in the familiar attitude of other monkeys. Strong tusk teeth, large flabby cheek-pouches, and long tail are other characteristics of the animal. It is usually a sullen creature, which defends itself by hurling stones or other handy missiles.

Baboons live in herds and eat fruits, roots, eggs, or insects. In South Africa, the *pig-tailed* baboon, or *chacma*, which lives in rocky regions because it is a poor tree climber, is fought by the natives because of the damage it does to crops. This type is grayish-brown, with long shaggy hair. The *hamadryad* of Abyssinia, once held sacred, has a cape of hair about its shoulders. See MANDRILL; MONKEY. M.J.H.

Scientific Name. Baboons belong to the family *Cercopithecidae*. The chacma is classed as *Cynocephalus porcarius*; the hamadryad, as *C. hamadryas*.

BABSON, ROGER (1875-), an American statistician, a native of Gloucester, Mass., and a graduate of Massachusetts Institute of Technology (1898). He was the founder of Babson's Statistical Organization at Wellesley Hills, Mass., with branch offices in many American cities, and he became the recognized guide in investments and a business barometer of the two

Americas. He won added fame in the world of economics when appointed by the United States government during the World War as director of general information for the guidance of the nation's officials.

His Publications. These include *Selected Investments; Bonds and Stocks*; also the *Future Series*, including *The Future of the Working Classes,—of the Churches,—of the Railroads,—of the Nations,—of the World Peace*, and *The Future of South America*. Besides the above, Mr. Babson has prepared at various times many documents for special purposes, not intended for general circulation.



THE BABOON

Photo: P & A



BABY, THE. A public awakened to the necessity of saving the babies—this is the outcome of one of the most important educational movements of the present time. The high death-rate among babies (see INFANT MORTALITY) was long regarded as a condition that could not be remedied. Babies were believed to be “hard to raise,” and it was expected that about one out of every five would die. People are wiser than they used to be. They have been brought to see that enlightened, intelligent care of infants is certain to lower the death rate, that the babies are the material out of which future citizens are made, and that healthy children are a nation’s most valuable asset. In France, where the declining birth rate made it absolutely necessary to save as many infants as possible, the baby-welfare movement was first placed on an organized basis. The results achieved there were brought to the notice of health authorities and social workers in other countries, and since the last decade of the nineteenth century, the slogan, “Save the babies,” has come to stand for a world-wide movement.

In the United States, the leadership in the work was taken by the American Association for the Study and Prevention of Infant Mortality (organized in 1909 with headquarters in Baltimore, Md.), and the topic has also been made the object of special investigation by the Federal Children’s Bureau (see CHILDREN’S BUREAU). Instruction and information are now reaching mothers and others who are interested, through various channels. Numerous pamphlets, books, and magazine articles on the subject have been issued and continue to come from the press; infant-welfare societies for practical work in homes and neighborhood centers have been organized, and in many communities baby “conferences” are held, at which the babies are examined and given marks on points of mental and physical development (see *Baby Clinics*, below).

The Baby’s Heritage. The leaders in infant-welfare work have not forgotten the ancient saying that “the sins of the fathers are visited upon the children unto the third and

fourth generation.” They recognize the right of the baby to be well born, and they preach the doctrine that diseased parents cannot produce healthy offspring. The special science that has to do with “better parents” is therefore inseparably bound up with the better-babies movement. It is known as EUGENICS, and is fully discussed in these volumes under that title.

Another and no less important phase of this movement is the care needed by the expectant mother before the baby comes. Her habits and the conditions surrounding her are vitally related to the welfare of the child. No mother can expect to have a strong, vigorous child if she is overworked, worried, unhappy, or ill nourished. Her diet should be most carefully selected because her own general condition and that of the baby depend upon it. This diet should include soups, fresh fish, eggs, cooked cereals, with cream, milk, and sugar, potatoes, asparagus, tomatoes, peas, lima and string beans, spinach, celery, lettuce, whole wheat, bran, Graham or corn bread, ripe raw fruits, and cooked fruits. Only light meats should be eaten, and these quite sparingly. Simple puddings, like custard, and pure ice cream are permissible. Pure water should be drunk freely; sweet milk, buttermilk, cocoa, and chocolate when made with milk are nourishing, milk being especially good for an expectant mother. She should not drink more than one cup of tea or coffee a day, and abstinence from both is desirable; and she should avoid all alcoholic drinks, rich desserts, and highly seasoned foods. There is no foundation of fact in the belief, somewhat prevalent, that beer is beneficial.

It is best for the expectant mother to bathe daily, although very hot or very cold baths are not advisable. Inhaling fresh air is quite as essential as bathing, for the lungs need oxygen as much as the body needs the cleansing medium of water. It is highly important, also, to keep the bowels moving every day. All the household tasks should be performed in well-ventilated rooms, and the sleeping room should be especially looked after in this matter.



Photo: U & U

CHILDREN ARE THE KEYS TO PARADISE

If there is anything that will endure
The eye of God, because it still is pure,

It is the spirit of a little child,
Fresh from His hand, and therefore undefiled.
—STODDARD.

If possible, the expectant mother should have an outside bedroom. Eight hours of sleep at night and a daily nap or rest period in the middle of the day are essential. Violent exercise and laborious work of any sort should be avoided, but the muscles must not be allowed to grow flabby and weak through inaction. A daily walk in the open air and such household tasks as are not tiring may be continued to the last. The clothing should be loose and comfortable, and lacing should be avoided as dangerous to both mother and child. It is also inadvisable to wear tight gloves or shoes.

The child of clean, healthy parents, possessing wholesome mental and physical habits, will be certain to possess the heritage of the well-born—a strong mind in a strong body.

Care of the Baby

There is nothing more helpless than a newborn infant. At the time of birth and for many months afterward, it is absolutely dependent on others for everything. For this reason, the care given the young child should be intelligent and systematic. The suggestions that follow apply, of course, to the average normal child. A sickly baby must have treatment and care which can be prescribed only by a physician familiar with the child's special needs. The baby who comes into the world in good health will develop normally if adequate attention is given to such essential matters as cleanliness, fresh air, sleep, hygienic clothing and habits, proper feeding, and free-

dom from undue excitement. Noise, irritation, and too much attention from adults is very harmful to the sound development of a baby.

Cleanliness. The daily bath not only adds greatly to the baby's comfort, but is necessary for its healthful development. After the child is ten days old, it should be bathed in a little tub of its own. For the average baby, the water should be at a temperature of 100° F. during the first eight weeks; it may then be lowered to 98°, and from the seventh to the twelfth month may be kept at 95°. During the second year a temperature of 85° to 90° is advisable. The mother should see that baby has a tub, wash cloths, towels, and soap of his own, and that these are kept scrupulously clean. Sponges are liable to become breeding-places for germs, and can well be dispensed with. The young baby has a tender skin and should be patted, not rubbed, dry. In some cases, the use of water is postponed until the third week, oil being used instead. Just as soon as the first teeth come, they should be brushed with a small soft brush; unless the mouth becomes infected, it need not be washed until the teeth come through, for pressure upon the developing teeth may break the delicate mucous membrane. After the teeth appear, the mouth should be washed daily. The clothing should be kept dry and clean, and be washed only with pure soap. Thorough rinsing is far more important than starching. Everything about the child should be clean and sanitary—the furnishings of its bed and

carriage, its toys, and the people who care for it.

Fresh Air and Sleep. No baby will thrive without an abundance of pure, fresh air. Except in severe winter weather, the child should be taken out for a daily airing; when bad weather prevents this, it should be dressed warmly, and the windows of the nursery should be thrown wide open for a half hour or more. If the carriage or crib is placed near a window and protected from drafts, the good effects of the outdoor airing may be had indoors. It is highly important that the sleeping room be thoroughly ventilated, and open windows will not give the child a cold if precautions are taken in regard to drafts. If there is danger that the wind will blow on the baby, a screen should be placed before the crib. In the summer, outdoor naps are excellent for the child, and a simple bed for the purpose can easily be made by anyone familiar with tools. This is essentially a box with a hinged top, set on strong rollers and having sides of wire or cotton mosquito netting. Wherever baby sleeps, he should be protected from flies and mosquitoes.

Modern research in regard to the effects of sunshine has established the importance of exposing babies, unclothed, to the direct rays of the sun. This practice gives them the benefit of ultra-violet rays, which are known to prevent rickets. The time and amount of exposure may well be left to the discretion of a physician.

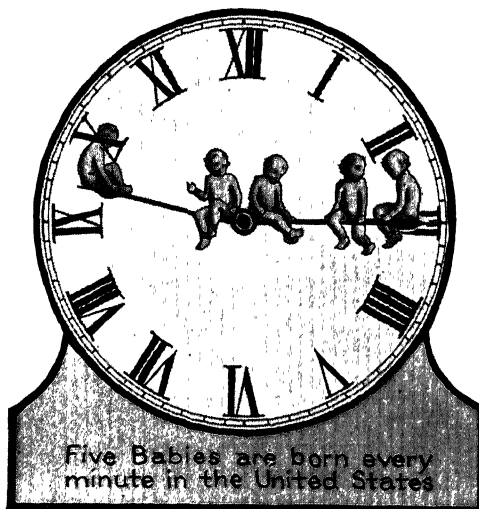
During the first month, the child should sleep twenty hours a day, and then sixteen hours a day until the end of the first year. Daily naps should be continued for several years. If it can possibly be arranged, the baby should sleep in a bed and in a room of its own. The practice of having an infant sleep with its mother is most unwise and is strongly condemned by all experts. Another unwise practice is that of rocking the child to sleep. It is quite unnecessary to begin that way, and the habit, if once acquired, is hard to break. It is better to lay the little one in its crib in a cool and quiet place, see that it is comfortable, and let it become accustomed to going to sleep alone. Pacifiers and other devices for putting children to sleep are pernicious, and should not be tolerated any

more than the soothing syrups and other patent mixtures that are frequently advertised.

Feeding. The ideal food for any baby, especially during the first few months, is milk from the mother's breast. Unless there are reasons which make it unwise or impossible to do so, every mother should nurse her child. Breast milk never sours, and is at all times ready for use. It does not have to be prepared, cooked, or measured, and it passes to the child's mouth directly from the source. It contains neither germs nor dirt, and so is a protection against many baby diseases, especially bowel disorders. It is the only perfect baby food known, for it contains all the food elements needed by the growing child, and these are always found in their proper proportions. By taking certain precautions, the nursing mother can protect her baby from the intestinal disorders that cause the death of so many infants. She must keep her own digestion in the proper condition, avoiding anything that may cause stomach and bowel trouble. She should eat nourishing food, drink plenty of pure water, have plenty of sleep and rest, exercise in the open air each day, avoid fretting or overworking, and endeavor not to nurse the baby when she herself is overheated or over-fatigued or worried. The breasts should be carefully washed with water or boric acid after each nursing.

Babies should be nursed at definite intervals, for regular feeding means regular sleep. If necessary at first, the child should be awakened at nursing time; he will soon acquire the habit of waking voluntarily when it is time to be fed. Dr. L. E. Holt, the well-known baby authority, advises the following schedule: Beginning with the third day, the baby should be fed not oftener than every three hours between

six in the morning and ten at night; during the night there should be but one nursing. After four months no night feeding after ten o'clock P.M. should be given, and after six months the day feedings should occur at four-hour intervals. Breast-fed babies should have cooled (not iced) boiled water to drink between feedings. In many cases the baby needs more than breast food after the first months, and it is advisable then to give one or two bottle feedings a day at the regular nursing periods.



As a rule, breast feeding should be discontinued at the twelfth month.

Artificial feeding has become so general that authorities are giving a great deal of study to the subject. It is of course not always possible to feed the baby at the breast. In such cases, the best substitute obtainable should be used, and that is clean, fresh milk from the cow. Every mother who feeds her baby from the bottle should insist on getting clean milk from a clean source. Milk delivered in bottles is the only safe kind, and city-dwellers should purchase *certified* milk. This is milk guaranteed to be produced under sanitary conditions and handled with special care. If there is ever any doubt about the purity of the milk, it should by all means be boiled. In the summer, babies should not be given milk that is over twenty-four hours old, and in winter any that is more than forty-eight hours old (see MILK).

The preparation of cow's milk for baby's use is a most important matter. Since it is "stronger" than the natural food from the mother's breast it must be *modified*, that is, adapted to the child's digestion. In many cases, infants thrive on simple dilutions of milk with boiled water, to which a small quantity of sugar is added. Before the baby's food is prepared, however, the mother should consult a physician who is experienced in infant feeding and who understands her child's needs. She should follow his directions carefully, weigh the child regularly, and see that it is being properly nourished. Babies differ considerably in the matter of artificial feeding, and it is not possible to give a set of directions applicable to all. Bottle-fed babies are more liable to colic than

those fed naturally, but this disorder can usually be prevented by rubbing the back of the child from the end of the spine upward, after each feeding.

One cannot be too careful in regard to the hygiene of artificial feeding. When the milk is delivered, it should be put on the ice at once, for warm milk spoils easily, and spoiled milk means a sick baby. All utensils required for preparing the food should be kept spotlessly clean, and it is a good idea to have a separate set of these for the baby's use alone. Round, plain bottles and plain nipples should be chosen, and these should be washed after each feeding. The old-fashioned bottle with the long tube is a breeder of disease and has no place in a "better baby's" equipment. The food should be prepared within twenty-four hours—earlier if possible—after delivery of the milk. As soon as it is ready, it should be poured into the nursing bottles, which are then carefully stoppered and placed on ice. Each bottle should hold just enough for one feeding. When it is time to feed the child, warm the milk by placing the bottle in hot water. Any food left in the bottle after the child has finished eating should be thrown out, as milk warmed a second time is liable to be unwholesome. No child should be allowed to suck on an empty bottle or to sleep with the nipple in his mouth.

In the case of healthy babies, weaning is a gradual process. By the twelfth month, the child, whether fed from the breast or from the bottle, should be trained to drink from a cup. At that age, the average child can digest undiluted milk and cereals, strained fruit juices, and plain mutton or chicken broth. During the second year, he should gradually become accustomed to solid foods, and at eighteen months he may be given potatoes, peas, beans, carrots, and beets, if they are thoroughly cooked and finely mashed. He may also have eggs, toast, cooked fruit, such as baked apple or apple sauce, and roasted or broiled chicken, roast lamb or chops, broiled fish, and roasted or broiled beef. The young child should not be given candy, soda water, tea, coffee, or any alcoholic beverage, and he should not be permitted to eat ice cream until he is two years old. The number of bottle feedings has all this time been gradually decreasing, and at eighteen or twenty months the weaning is completed. Throughout the period of childhood, the mother should see that the child has wholesome, nourishing food and is kept from eating rich desserts, stimulants, and an excessive amount of candy. Too many sweets injure both the teeth and the digestion. Babies should be given cod-liver oil from an early period, because it contains the vitamin that prevents rickets.



FOOTPRINT OF NEWBORN
BABY, NATURAL SIZE

This print is part of the identification system employed in modern lying-in hospitals. On the slip bearing the impression of the print is recorded the name, sex, and weight of the baby at birth, as well as the date. A strip of adhesive tape on baby's back, bearing its name, and a tag on the wrist complete the identification scheme. The adhesive tape is not removed until the baby leaves the hospital, and then in the presence of the mother. (Loud yells from the infant at this stage.)

Other Suggestions. To-day's babies are more comfortably dressed than those of a generation ago. The practice of swaddling the little creatures in many layers of elaborate clothing has been happily outlawed. A properly dressed baby has his clothing made to hang from the shoulders, and his slips, dresses, and wrappers are one-piece garments. Tight clothing interferes with the circulation, breathing, and digestion, and is decidedly uncomfortable. It is a mistake, also, to put too many and too heavy garments on the child; if he perspires freely in winter or summer he is overdressed. Prickly heat is evidence that an infant is dressed too warmly. For underwear, select that made of medium-weight, soft, porous cotton, which is as warm as wool, and more hygienic and economical. All-wool garments are irritating to the tender skin.

Babies should not be bounced about or frolicked with, rocked or jogged. During the first few months, they will get sufficient exercise through crying and tossing their arms and legs about. The baby who is constantly played with and over-stimulated will develop into a nervous child. Babies should not be kissed indiscriminately, and never on the mouth. Many infectious diseases are communicated through kissing and careless exposure of the child. Mothers should refuse to believe that it is necessary for their children to have measles, mumps, whooping cough, and other childhood ailments. Rather, they should see to it that the little ones are properly safeguarded. This care should extend to the child's playthings, from which should be excluded woolly animals and toys covered with poisonous paint. Baby has a tendency to put everything he grasps into his mouth, and he should never be allowed to play with toys that may be, and probably are, unsanitary.

Baby Clinics

Baby clinics have become popular in numerous localities; they are usually conducted under the auspices of women's clubs, health boards, infant-welfare societies, parent-teacher associations, civic clubs, and similar organizations. The purpose of these clinics is to arouse interest in the hygienic and intelligent care of children. They are educational rather than competitive.

The children are examined and scored by

competent physicians. In every case a standard is established, and a child is judged according to that standard. A typical score card would contain the following points, each of which is marked on the scale of 100: height; weight; circumference of chest; circumference of abdomen; symmetry; quality of skin and fat; quality of muscles, hand grasp, rising, sitting, poise, walking, running; bones of skull, spine, chest, limbs, and feet; length of head, width, and circumference; pupillary distance and shape of eyes; shape, size, and position of ears; shape and size of lips; shape and size of forehead; shape of nose; shape and condition of jaw, hard palate, and nostrils; number, shape, size, and condition of teeth; disposition; energy; facial and ocular expression; attention. Beauty of face or body is not considered, but physical and mental development; a high-grade child, however, well nourished, clean and firm of flesh, cannot be anything but wholesome and attractive.

The perfect child has the following measurements (one pound less being counted for girls):

Average weight, height, and circumference of head and chest (for boys):

At birth—Weight, $7\frac{1}{2}$ pounds; height, $20\frac{1}{2}$ inches; chest, $13\frac{1}{2}$ inches; head, 14 inches.

One year—Weight, 21 pounds; height, 29 inches; chest, 18 inches; head, 18 inches.

Two years—Weight, $26\frac{1}{2}$ pounds; height, $32\frac{1}{2}$ inches; chest, 19 inches; head, 19 inches.

Three years—Weight, 31 pounds; height, 35 inches; chest, 20 inches; head, $19\frac{1}{4}$ inches.

Teeth—Central incisors appear about the seventh month; lateral incisors from eighth to tenth; anterior molars, twelfth to eighteenth; eye and stomach, fourteenth to twentieth; posterior molars, eighteenth to thirty-sixth.

The child should make the first attempt to sit up at about the sixteenth week, be able to do so at about the fortieth, and be firmly seated at the end of the tenth or eleventh month.

The first attempt to stand should be made about the thirty-eighth week. The fourteenth or fifteenth month is the average period for walking. A child who cannot walk by the eighteenth month is backward in that respect.

The flesh should be firm, the skin pink, the lips red, the tongue uncoated, and the breath sweet. Breathing should be done through the nose. The child should not be fretful, nervous, or disinclined to play.

The normal child can say words like *mamma*, *kitty*, *down*, etc., by the end of eighteen months. By the end of the second year it is able to join words into short sentences.



OUTLINE AND QUESTIONS ON THE BABY

Outline

I. The Right to Be Well Born

- (1) Eugenics
- (2) Care of the mother—as to
 - (a) Food
 - (b) Bathing
 - (c) Rest
 - (d) Exercise
 - (e) Clothing

II. Care of the Baby

- (1) Keeping the baby clean
 - (a) The bath
 - 1. Frequency
 - 2. Temperature
 - 3. Method
 - (b) Care of the eyes (see BLINDNESS)
 - (c) Care of the teeth
 - (d) Care of the clothing
- (2) Sleep
 - (a) Amount needed
 - (b) Harmfulness of “putting the baby to sleep”
 - (c) Advantage of fresh air
 - 1. An out-of-door sleeping box
- (3) Proper feeding
 - (a) Decided advantage of breast-feeding
 - 1. Frequency of nursing
 - 2. Need for additional food
 - (b) Artificial feeding
 - 1. Certified milk
 - 2. Modifying milk
 - 3. Necessity for cleanliness
 - 4. Proper bottles

(c) Weaning

- 1. A gradual process
- (d) Proper food for the weaned child
- (4) Clothing
 - (a) Simplicity
 - (b) Danger of too heavy clothing
- (5) To be avoided
 - (a) Over-stimulation
 - (b) Kissing
 - (c) Unsanitary toys

III. Children's Diseases

- (1) Chicken pox
- (2) Cholera infantum
- (3) Croup
- (4) Diphtheria
- (5) Infantile paralysis
- (6) Measles
- (7) Scarlet fever
- (8) Whooping cough

IV. The “Better Babies” Movement

- (1) History
 - (a) Beginnings in France
 - (b) Growth in America
- (2) Baby conferences
 - (a) Purpose
 - (b) Method
 - (c) Scoring
 - (d) Measurements of the perfect child

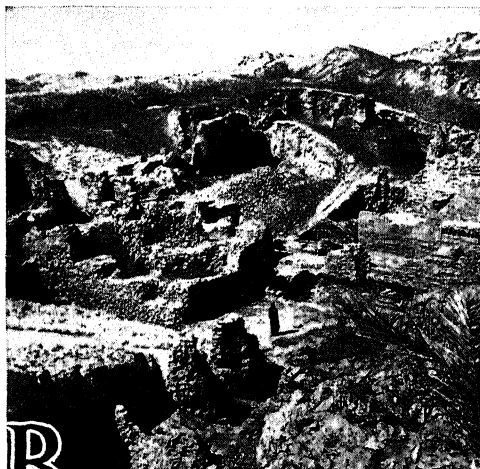
Questions

- What may an eighteen-months-old baby eat?
- What is the safe and sensible way of putting a baby to sleep?
- How tall should a baby be at the age of one year? What should be the circumference of its head?
- What is the science called which has to do with “better parents”?
- What are the advantages of mother's milk over cow's milk for a baby?
- How often should a baby be bathed? Is a “good rub down” at the end of the bath beneficial?
- How has the theory regarding the necessity of children's diseases changed?
- What is meant by “modifying” cow's milk, and why is it necessary?
- How would you make an outdoor sleeping box for a baby?
- How often should a baby be fed?
- What is the object of baby clinics, and how are the babies scored?
- How has the United States recognized officially the importance of the “better babies” movement?

Baby clinics have been productive of so much good that they are being encouraged by such an authoritative body as the American Medical Association (535 N. Dearborn St., Chicago). By applying to the Secretary of the Council on Health and Public Instruction at this address, full instructions for establishing, together with score cards and other material, can be obtained. Literature and score cards are also distributed by health authorities of many cities. M.V.O's.

Related Subjects. The reader who is interested in this topic will find much that is helpful in the following articles:

Blindness	Husband and Wife
Chicken Pox	Infantile Paralysis
Child	Infant Mortality
Cholera (Cholera Infantum)	Measles
Cod-Liver Oil	Milk
Croup	Rickets
Diphtheria	Scarlet Fever
Eugenics	Ultra-Violet Rays
Fly	Vitamins
Health Habits	Whooping Cough



BABYLON, *bab' i lon*, a city of the ancient world, the capital of Babylonia, situated on the left bank of the Euphrates River, about seventy miles south of Baghdad. Babylon, whose name is the Greek form of a word meaning *gate of the gods*, is first known to history as the city of Sargon of Akkad (about 3800 B.C.). As the capital of all Babylonia from 2094 B.C., it was the prey of numerous Assyrian kings until 689 B.C., when it was destroyed by Sennacherib. It was rebuilt by his successor, Esarhaddon, and then under Nebuchadnezzar (604-561 B.C.) became one of the wonders of the ancient world, its walls of immense height and thickness enclosing magnificent buildings and pleasure grounds. The celebrated Hanging Gardens and the great temple of Bel are among the ancient world's greatest achievements.

The city under Nebuchadnezzar was built in the form of a square, the area of which modern scholars give as twelve square miles. Cyrus

the Great seized the city in 538 B.C., and with this conquest it became a part of the Persian Empire. Under the Persian monarchs, the once famous city began a rapid decline, and when Alexander the Great entered it, he found it falling into ruins.

The history of Babylon ends practically in 275 B.C., when the remaining inhabitants were taken to the newly founded city of Selucia. Modern excavations, begun in 1899, have brought to light many art treasures and inscriptions that reveal interesting facts about life and religious worship in the city which Nebuchadnezzar called "Babylon the Great"; but little has been found which throws light on the earlier periods of its history.

[In the illustration is shown one of the palaces recently excavated among the ruins of Babylon. It is believed to have been one of the palaces of Nebuchadnezzar; it was certainly a royal palace, because of the lion at one of the entrances (seen in the middle distance). Photo: U&U.]

The Hanging Gardens of Babylon were regarded as one of the seven wonders of the ancient world. According to accepted belief, they were constructed by King Nebuchadnezzar as a pleasure resort for his Median wife, Amytis, whom he had brought from a mountainous region, and who had wearied of the level plains of her adopted country. The square enclosure, measuring about 400 feet each way, contained flower gardens, groves, and avenues of trees, with fountains and banquet rooms distributed at intervals. The entire area was raised in terraces by means of tiers of masonry to heights of from seventy-five to 300 feet. Water for irrigating purposes was pumped from the Euphrates River by a device said to resemble the screw of Archimedes (see ARCHIMEDEAN SCREW). Some authorities attribute the construction of the hanging gardens to Semiramis, a semi-historic queen of Assyria. See illustration, page 4866.

Related Subjects. The reader is referred in these volumes to the following articles:

Babylonia	Nebuchadnezzar
Iraq	Sennacherib

Seven Wonders of the Ancient World

BABYLONIA, *bab i lo' ni ah*, in ancient times, the southern portion of the Tigris-Euphrates Valley, the seat of a mighty empire, the earliest in the history of mankind. This land, after centuries of varying fortune, became a part of the Turkish Empire, and now is included in the modern Iraq.

Geography. Babylonia was a plain lying south of Assyria and Susiana, and stretching southward to the Persian Gulf. Westward, it merged with the Arabian Desert; along the eastern border flowed the River Tigris. At various times its rule extended westward to the sea. The name Babylonia comes from Babylon, the ancient capital of the district, and the latter term is used in the Old Testament to mean the country as a whole. Akkad, or Accad, and Shumar, or Shinar, were names applied in early times to the northern and southern divisions.

BABYLONIA



*"Five thousand mighty cedars
I spread for its roof."*

Cuneiform writing, and translation



Lion from Nimrud



Babylonia at its greatest extent



The famous Hanging Gardens
Built to please a woman



Present-day site of Babylon

PRINCIPAL DATES	B.C.
NIMROD FOUNDED BABYLON ABOUT	2300
RISE OF ASSYRIA	1250
ERA OF NABONASSAR	747
FALL OF NINEVEH	625
CYRUS CAPTURED BABYLON	538
ALEXANDER CAPTURED BABYLON	331



Bas-relief of warriors in battle



Babylon

Like the valley of the Nile, the Babylonian plain was enriched by the deposits of rivers, and so fertile was the land that tradition made this region the scene of the Garden of Eden, out of the ground of which "God made to grow every tree that is pleasant to the sight and good for food" (*Genesis II, 9*). In ancient times Babylonia was covered by a network of dikes and canals, the ruins of which may still be seen in the present cheerless waste of country.

People. It is supposed that the Babylonians were a union of the Semitic and non-Semitic races, the latter being the first inhabitants of the country, and the former a people who came there from Arabia. They were an industrious and peace-loving people, and became renowned as farmers and traders. Their harvest of grain excited the amazement of the Greek historian Herodotus. Across the Arabian Desert came caravans laden with precious stones, spices, copper, and gold, exactly as they do to-day; from the East they received marble and precious metals, and the kings bought cedar wood obtained from the Syrian mountains to adorn their temples and palaces. Babylonian traders traveled to far-distant lands with native products, thus putting the ancient world in contact with Babylonian civilization.

Their language was much like that of the Hebrews and Phoenicians, and was written in

the form of wedge-shaped characters, to which the name *cuneiform* has been given. For writing materials, they used clay and stone tablets, especially the former. Babylonian literature included many different subjects—hymns, prayers to the gods, poetry, myths, history, science, agriculture, and law. The Babylonians were ruled by kings who had absolute power; under the king were officers called *viceroy*s, who governed the provinces. They had a religion of many gods, and each important city was the center of the worship of a particular god. They also believed that the earth was peopled by good and evil spirits who could aid or harm men. Proper burial of the dead was thought necessary, in order that their ghosts might not return to trouble their relatives.

Art. The Babylonians were the first people to practice architecture as a fine art. As their country produced no stone, they were forced to use sun-dried clay bricks as building material. To give their temples and palaces a firm foundation and also to lend dignity to the structures, they erected these buildings on great brick platforms, sometimes forty feet above the plain. Their palaces were one-story structures having many rooms, courts, and passages, thick, vertical walls, and flat roofs. The temples were sometimes one story high, but oftener were a type peculiar to Babylonia—

Outline and Questions on Babylonia

I. The Country

- (1) Location, in Tigris-Euphrates Valley
- (2) Fertility of the soil
 - (a) Agriculture

II. The People

- (1) Origin
- (2) Characteristics
- (3) Language and literature
 - (a) Cuneiform inscriptions
- (4) Commercial ventures
- (5) Art
 - (a) Architecture
 - (b) Sculpture
 - (c) Minor arts
- (6) Religion
- (7) Government

III. History

- (1) The Old Empire
- (2) Assyrian supremacy
- (3) Capture of Nineveh
- (4) The New Empire
- (5) Later subject condition

Questions

Of what country is old Babylon now a part?

Was ancient Babylonia an isolated nation, or did it have intercourse with other countries?

Who drew up the earliest known code of laws?

How did the empire rank among others in point of age?

Why was this valley made the traditional site of the Garden of Eden?

What art originated with the Babylonians?

What other names did the country bear?

Wherein did the religion of the Babylonians differ decidedly from that of the Hebrews?

Were they naturally a warlike people?

To what nations were they subjected during the course of the centuries?

What is there to show that the people employed irrigation?

Describe a typical Babylonian temple.

What sort of writing material was employed?

What were the written characters called, and what other nation used them?

Who was Nebuchadnezzar, and how was he punished for his pride?

Who was the "impious destroyer of Babylon"?

Who was Babylon's greatest ruler?

a series of solid masses of brick placed one above the other, with each story smaller than the one beneath it. The plainness of these buildings was relieved by covering the bricks with stucco, upon which designs were painted. The Babylonians made great progress in sculpture and engraving, and their alabaster and terra-cotta vases, copper and bronze statuettes, glazed tiles, seals, and gems showed their ability in the minor arts.

History. The history of Babylonia, like that of Assyria, begins in obscurity, and the two districts were so closely connected that historians find it impossible to treat them separately. The first line of kings of whom there is a clear record ruled about 4500 B.C. The first great name in Babylonian history is that of King Hammurabi (about 2100 B.C.), founder of the "Old Babylonian Empire," who chose Babylon as the seat of government, and who made the oldest code of laws known to man. For over five centuries after 1761 B.C., Babylonia was ruled by Kassites, a people from Media, but a native king sat on the throne in 1185 B.C.

In the meantime, there had been centuries of warfare with Assyria; and Babylonia, reduced to an Assyrian province in the eighth century, was completely conquered in 689 B.C. by Sennacherib, the impious destroyer of Babylon. Nearly a century later the Babylonians, aided by a horde of Medes under Cyaxares, revolted, and captured and destroyed the Assyrian city of Nineveh. A new Babylonian kingdom was set up, which grew to be a great empire under Nebuchadnezzar. This is known in history as the "New Babylonian Empire." A line of weak kings followed Nebuchadnezzar, and in 538 B.C. Babylon was captured by Cyrus the Great of Persia. Thereafter, Babylonia was a Persian province until, with the conquest of Alexander the Great, it passed under Greek control and then into the hands of the Parthians. Under the Parthians, all that remained of Babylonian culture was lost. In A.D. 1000, the country was given over to the Bedouins and Arabs, and in 1638 it passed into Turkish control, and so remained until after the World War.

Related Subjects. The reader is referred in these volumes to the following articles:

Assyria	Iraq
Babylon	Nebuchadnezzar
Cuneiform Inscriptions	Sennacherib

BACCHANALIA, *bak a na' lih ah*. See BACCHUS.

BACCHANTES, *ba kan' teez*. See PARNASSUS; BACCHUS.

BACCHUS, *bak' kus* (in Greek, DIONYSUS), in classic mythology the god of wine, was the son of Jupiter and Semele. In his early days he was mad, but Rhea cured him and taught

him how to cultivate the vine and how to make the wine from the fruit. Great feasts, known as *Bacchanalia*, or *Dionysia*, were held at Athens in his honor. These were introduced into Rome in the second century B.C., but they became so debasing that they were forbidden in 186 B.C. by the Roman Senate. In art, the forehead of the god is crowned with vine leaves or ivy, and he is represented as naked, or wearing a wide mantle about his shoulders and a faun skin across his breast.

When Theseus abandoned Ariadne on Naxos, Bacchus found and married her. He gave her a crown of gems, and on her death placed her as a constellation in the sky.

Bacchantes. The worshippers of Bacchus, both men and women, were called Bacchantes. These people, at the time of the feast of Bacchus, would gather on the woody heights, and, roused to frenzy by wine and excitement, spend days and nights in dancing and rioting. In modern speech, *bacchanitic* is applied to riotous or drunken revels.

Related Subjects. The reader is referred in these volumes to the following articles:

Ariadne	Rhea
Jupiter	Semele
Midas	Theseus

BACH, *bahK*, JOHANN SEBASTIAN (1685-1750), the first of the great German musicians, unequaled as a composer of organ and choral music. He has been called the "master of masters," because his works inspired so many of the famous musicians who followed him—among them Mozart, Beethoven, Mendelssohn, Schumann, Chopin, Liszt, Rubinstein, and Wagner. Bach came of a family distinguished in music for many generations, and he was trained in the art from early childhood. He secured his first paying position, that of violinist at the court at Weimar, when he was eighteen, and afterward held several organ and choir positions until 1723. In that year he became music director in the principal churches at Leipzig, where he remained until his death. Bach was married twice, and eleven of his twenty children were musicians.

His Place in Music. Bach composed for the organ, piano, stringed instruments, and the human voice. His vocal works, including passion music, oratorios,

masses, and cantatas, are masterpieces, and his *Saint Matthew Passion*, *Mass in B Minor*, and *Saint John Passion* are the greatest choral pieces ever written. His *Contest of Phoebus and Pan* is a famous cantata, and well-known oratorios are those for Easter and Christmas. Bach was the greatest organist of his time, and his preludes and fugues for the organ are the most perfect ever composed. *The Well-tempered Clavichord* is a book of instruction of great value. He also brought out a new system of fingering, which has had great influence on modern piano playing.

BACHELLER, *batch' el ur*, IRVING (1859-), an American novelist. He was born at Pierpont, N. Y., in a house overlooking Paradise Valley, the scene of the first part of his *Eben Holden*, the most widely read of his books. He was graduated at Saint Lawrence University, Canton, N. Y., and his first writings consisted of articles for several New York papers. Before *Eben Holden* appeared, in 1900, he had published two novels and conducted a bureau for supplying magazines with literary material. Urged by a friend to put more of human interest into his stories, he wrote three novels of the North Adirondack region that established his fame, the one mentioned above, and *Dri and I* and *Darrel of the Blessed Isles*. All of his books are enlivened by quaint humor and homely philosophy. *Charge It* and *Keeping up with Lizzie* ridicule modern habits of spending money. *A Man for the Ages* is a story woven around the theme of the immortal Lincoln. It was followed by *The Prodigal Village*, *In the Days of Poor Richard*, *The Scudders*, *Dawn*, and *The House of the Three Ganders*.

BACHELOR'S BUTTON, a name shared by several plants whose flower heads resemble buttons, notably the bright-yellow, double buttercup, the blue cornflower, known in Germany as the *Kaiser-blume*, and the purple globe amaranth. The children prefer to believe the story that bachelor's buttons are so called because they were once carried about by young bachelors who were in love. A quick fading of the flower was a sign that their affection was not returned, but if the flower kept its freshness, they knew their affairs of the heart would prosper. See BUTTERCUP; KAISER-BLUME; AMARANTH. See illustration, page 564. B.M.D.

BACILLUS, *ba sil' us*. See BACTERIA AND BACTERIOLOGY.

BACKELAND, *bak' e land*, L. H. See BAKELITE.



Bacchus, that first from out the purple grape
Crushed the sweet poison of misused wine.

—From Milton's *Comus*.

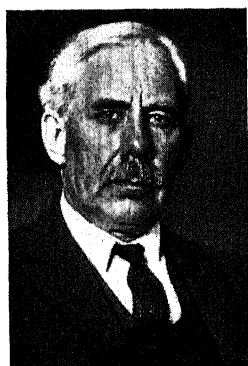


Photo: U & U

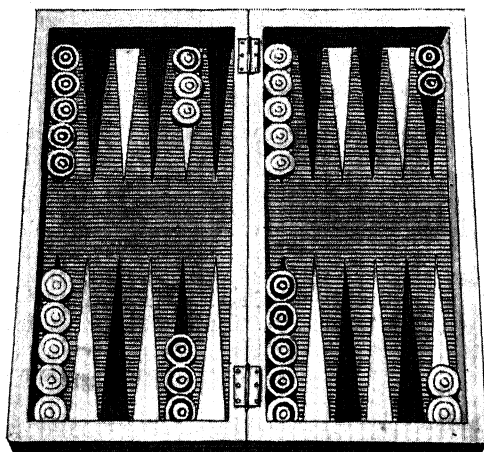
IRVING BACHELLER



Photo: Visual Education Service

BACHELOR'S BUTTON

BACKGAMMON, *bak' gam on*, a game of very ancient origin, played by two people upon a board made for the purpose, containing twenty-four spear-shaped divisions called *points*, divided into four sections of six points. Each player takes 15 "men," or checkers, which are placed on the table in the manner shown in the illustration. A player then makes a throw with two dice. The score of the dice indicates the point to which a checker may be moved, the points nearest to each player being numbered from 1 to 12. The object of the game

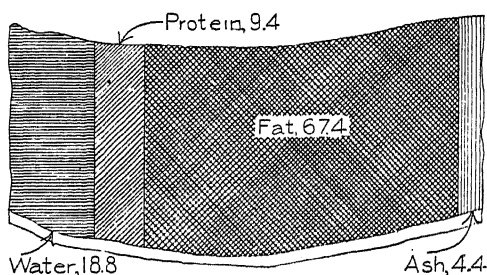


BACKGAMMON BOARD

is to move all the checkers from point to point around the table on to the fourth section of 6 points. From there they are removed in order, according to the score of the dice thrown. The player first removing all his checkers is the winner.

Derivation. The word *backgammon* is usually considered a contraction of a Welsh word meaning *little bottle*.

BA'CON, flesh from the back and sides of a hog, prepared for the table by salting and smoking. Bacon may be cured by the dry-salting or by the wet-brine method. Sometimes sugar and other substances are added to improve the flavor; saltpeter is used to impart a desirable color. The salt is chiefly valuable as a preservative. After curing for several



FOOD VALUE OF BACON

Average composition of the edible portion of bacon. A cut showing these percentages has a fuel value of 3,020 calories per pound.

days, the meat is rinsed, and then smoked in the fumes from a hardwood fire. Smoking not only helps to preserve the meat, but it also gives it better flavor.

Bacon is commonly called fat pork, when compared with ham, which contains about half as much fat (see accompanying diagram). It is a favorite breakfast meat, and is also popular for use in toasted sandwiches, but whoever buys meat for the table should remember that bacon is a concentrated fuel food. It is well to serve it sparingly in warm weather or in combination with other energy foods. Because of the processes used in its curing and smoking, bacon is somewhat resistant to the digestive juices, and so remains in the stomach longer than fresh pork.

E.V.M'C.

Related Subjects. The reader is referred in these volumes to the following articles:

Ham	Metabolism
Meat and	Nutrition
Meat Packing	Pork

BACON, FRANCIS (1561-1626), an English philosopher, statesman, and jurist, whose *Essays* also rank him among the greatest of the world's writers. He was born of good family, studied at Cambridge, and rounded out his education with foreign travel. That he was a born courtier is shown by his reply to Queen Elizabeth, who when he was but a boy, asked him his age. Bowing low he, replied, "Two years younger than your majesty's happy reign."

Admitted to the bar when but twenty-one, he made an immediate reputation, and two years later entered Parliament. In 1618 he was named lord high chancellor, and in 1621 was raised to the peerage as Viscount of Saint Albans. He was accused of corruption as a

judge, and on pleading guilty to the charge, was heavily fined and sentenced to the Tower during the king's pleasure. Subsequently, his punishment was practically remitted, though not until he had suffered greatly from the disgrace.

Bacon's chief title to renown rests upon his development of the reasoning (see LOGIC). He undertook to re-arrange the whole system of human knowledge, and though his task was too great for him, he contributed more to real scientific progress than any other man since the days of the Greek philosophers. The illness of which he died was contracted while he was making an experiment with snow, the success of which led to the cold-storage systems of to-day.

His *Essays*, fifty-eight in number, treating of a great variety of subjects, are as bright, as fresh, as applicable to life as when they were written. They are so full of meaning, so condensed in style, and so logical in arrangement, that they repay the closest study. Some of these are generally included among college entrance requirements in English. The one most read by young people, and probably more appropriate for them than any of the others, is *Of Studies*. (See ESSAY). See, also, SHAKESPEARE, WILLIAM (Shakespeare-Bacon Controversy).

BACON, JOSEPHINE DODGE DASKAM (1876-), an American story-writer whose humor, original ideas, and brilliant style have won for her a wide circle of readers. She was born at Stamford, Conn., educated at Smith College, and began her literary work by writing poems and stories for the *Atlantic Monthly* and other magazines of like high character. Her *Smith College Stories*, a delightful series for girls, published in 1900, established her reputation, and she has remained a popular favorite through a varied literary career. In 1903 Miss Daskam married Sheldon Bacon.

Characteristic Writings. Following her *Smith College Stories*, she wrote short stories and novels in rapid succession. Well-known titles include *The Madness of Philip*, *Memoirs of a Baby*, *Ten to Seventeen*, *The Strange Cases of Dr. Stanchon*, *To-Day's Daughter*, *Open Market*, *Square Peggy*, *Blind Cupid*, *Truth O'Women*, *Medusa's Head*, and *Counterpoint*. She also compiled *Best Nonsense Verse*.



Photo: Brown Bros.

FRANCIS BACON

If parts allure thee, think
how Bacon shin'd,
The wisest, brightest,
meanest of mankind.

—From Pope's *Essay on Man*.

BACON, NATHANIEL. See BACON'S REBELLION; BERKELEY, SIR WILLIAM.

BACON, ROGER (1214-1294), an English monk and philosopher, one of the great men of the thirteenth century. He raised himself far above his age and added much to what was then known of science and nature. Bacon attended the universities of Oxford and Paris, receiving at the latter the degree of Doctor of Theology.

On or about the year 1250, he joined the Franciscan Order and settled at Oxford, where he began a deep study of physics. Having announced discoveries in that science, he was accused by his fellow Franciscans of dealing in the "black art," the devil's magic, and was removed to Paris, where he remained for ten years in prison, without books or instruments. Though free from persecution for the next ten years, he was imprisoned a second time in 1278, through the ill-will of the head of the Franciscan Order. About 1288, he was permitted to return to Oxford, where he remained until his death.

Bacon held some of the incorrect ideas of his own time, but deserves honor for the new knowledge he gave the world on the subject

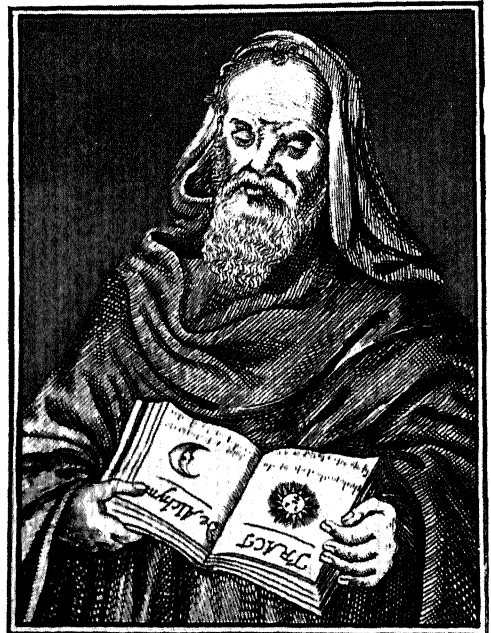
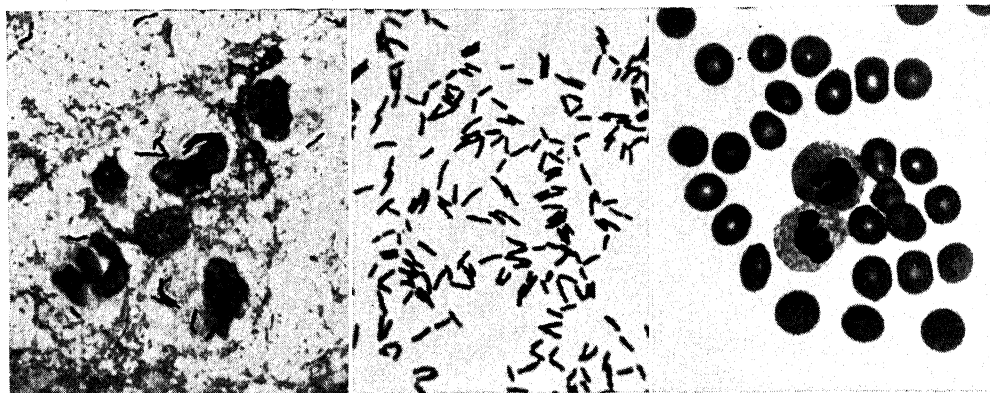


Photo: Brown Bros.

ROGER BACON

of light and vision, for several discoveries in chemistry, for pointing out errors in the calendar, and for establishing scientific method in the investigation of all objects and phenomena. A copy of the corrected calendar which he made in 1263 is now in the library of University College, Oxford. His most im-



Photos: Visual Education Service

BACILLI OF TUBERCULOSIS
(Magnified 1200 diameters)BACILLI OF DIPHTHERIA
(Magnified 1200 diameters)HUMAN BLOOD
(Magnified 750 diameters)

portant writing is the *Opus Majus* (Great Work), an encyclopedia of the sciences.

[For Bacon's connection with the adoption of gunpowder, see article under that title.]

BACON'S REBELLION, an uprising of the Virginia colonists in 1676, directed against the mismanagement of affairs by Governor Berkeley. It was headed by Nathaniel Bacon, a young planter who had settled in Virginia in 1673. He became a member of the governor's council, and won the affection and trust of the colonists by his kindly manners. Like his fellow colonists, he had been bitterly opposed to the policy of the home government and of Governor Berkeley, their chief causes for complaint being unequal taxation, the payment of unjust tobacco duties, and unfairness in the voting system.

This discontent became open rebellion when the governor refused to protect the people from outbreaks of the Indians. When his plantation on the site of the present city of Richmond had been attacked, Bacon asked the governor to permit him to head a band of troops against the Indians. When Berkeley refused, Bacon led out a company without that officer's consent. Some fighting took place, and Jamestown was burned, but the sudden death of Bacon put an end to the rebellion. Berkeley executed a number of the leaders in the affair. Though nothing was gained, the uprising showed the courageous spirit of the Virginia colonists.

Related Subject. In these volumes, see the article **BERKELEY, SIR WILLIAM**, for an opinion of the governor expressed by the king of England.

BACTERIA AND BACTERIOLOGY, *bak-te'ri ah*, *bak-te-ri ahl' o gie*. Bacteria are minute bits of protoplasm, the simplest and smallest forms of plant life. It is difficult for us to comprehend either their size or their number. All of them are far too small to be seen with the naked eye, and some remain

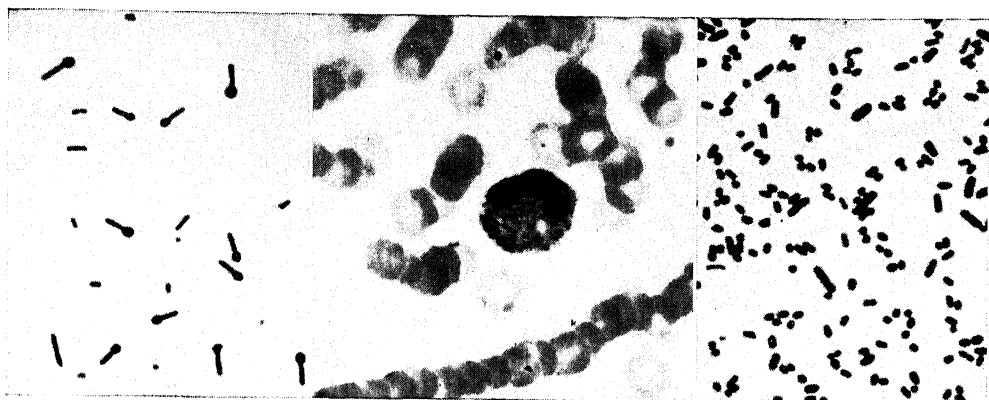
invisible even when viewed through a powerful microscope. Their existence is known, however, because of certain well-defined effects. Twenty-five thousand bacteria of average size, placed side by side, would make a row only one inch long. The *micron*, a measure of length equal to $1/25,000$ of an inch, or one-millionth of a meter, was invented to give scientists a convenient unit in expressing bacterial dimensions.

These one-celled plants reproduce by splitting into two sections. Under particularly favorable conditions, the process takes place rapidly, a single cell reaching maturity and dividing into two parts in half an hour or less. It has been calculated that 17,000,000 cells would come into existence from a single cell, if progressive division took place once an hour for twenty-four hours. At the end of forty-eight hours there would be hundreds of billions of cells.

Bacteria must have certain conditions of food, heat, and moisture to multiply without interruption, or even to remain alive. Some of them produce spores, which are types of cells that are peculiarly resistant to a poor environment. A bacterium may remain in this form indefinitely, and when a favorable modification occurs, resume its typical character.

These organisms affect mankind in many ways (see subhead, below). Because some of them cause disease, misery, and death, bacteria as a group are often thought of as man's enemies, but it should be remembered that the useful and harmless organisms far outnumber the malignant ones.

Kinds. Biologists place all bacteria in the class *Schizomycetes*, and divide this group into two main subdivisions, one consisting of the lower and simpler forms, and the other including the more highly developed cells. The technical grouping of bacteria into orders is a matter upon which there is no general agree-



BACILLI OF TETANUS

MICROCOCCHI IN A BLOOD CELL
(All of the above magnified 1200 diameters)BACILLI OF TYPHOID
(Typical)

Photos: Visual Education Service

ment, but the following terms are in common use in most textbooks:

According to their shapes, bacteria are divided into three groups: (1) the *bacillus* (plural, *bacilli*) is rod-shaped; (2) the *spirillum* (plural, *spirilla*) is longer than the bacillus, but is curved or spiral; (3) the *micrococcus* (plural, *micrococci*) is more or less spherical. Each of these classes shows many varieties. Bacilli, for example, may be found singly, in pairs, or in long strings. Spirilla may look like commas, or they may be long, thin spirals, or short, thick ones. If micrococci are arranged in rows like strings of beads, they are called *streptococci*. Each kind reproduces its kind. Typhoid fever and tuberculosis are caused by bacilli; Asiatic cholera by spirilla; and pneumonia by micrococci (pneumococci).

Bacteria that find favorable conditions on entering living tissue and that cause specific diseases are said to be *pathogenic*. Those that die quickly or are not injurious to the tissue are called *non-pathogenic*. These terms imply relative rather than absolute distinctions, for the same organism may be harmful under some conditions, and innocuous under others. Bacteria that grow only when there is a free supply of oxygen are known as *aerobes*; those that thrive in an environment with little or no oxygen are called *anaerobes*. Subdivisions of these groups are recognized, as some bacteria are able to adapt themselves to both conditions.

Bacteria that are able to move about are called *motile*; others are *non-motile*. The former make use of hairlike extensions of the cell body. By whipping these flagella back and forth, the bacteria propel themselves through liquid media. This peculiarity led the first observer of microorganisms to call them little animals. There are one-celled organisms of the animal world (protozoans) which only the trained biologist can distinguish from bacteria, but the latter are always classed

definitely as minute plants. Both kinds are commonly called germs.

Activities of Bacteria. Most bacteria live upon the bodies of dead plants and animals, or upon their excretions; those that subsist upon living tissues are the disease-producing kind. These destroy other lives to perpetuate their own. Roughly, the two kinds are classed as *saprophytes* and *parasites*, but the conditions of the environment are an important factor in every case, and no hard-and-fast distinction can be drawn between these groups. Bacteria act chiefly by breaking up complex molecules into simpler substances. They are the causal agents of putrefaction, or decay; they bring about the chemical changes (fermentations) that occur when milk turns sour, butter becomes rancid, cheese ripens, and tobacco cures. They are responsible for the ferments that produce alcohol, vinegar, and silage, and that help to digest our food. It is bacterial action that causes food to spoil when placed in cans or jars without proper sterilization.

In the industrial world, bacterial activity is utilized in the tanning of leather and the retting of hemp and flax. Bacteria also bring about chemical changes in the soil that are of vital importance to the farmer. By causing the decay of organic matter, they add much to the fertility of the land. Certain bacteria that live in the nodules on the roots of clover and other legumes have the power of combining atmospheric nitrogen with other elements and fixing it in the soil for the use of plants. There are other organisms that change sulphur and sulphides to sulphuric acid (see OXIDATION). A soil treated with sulphur becomes strongly acid, and this fact is made use of in combating potato scab disease, which can be destroyed by the acidity of its environment. The phosphorescence of fireflies is due to the activity of bacteria.

Pathogenic bacteria are the cause of most of the infectious diseases that attack men and animals. Many of the specific causal bacteria have been identified by means of the microscope; others, invisible under the strongest magnifiers, are capable of passing through the pores of porcelain filters. The existence of these filterable viruses has been proved by experiment. Organisms of this group are responsible for smallpox, mumps, yellow fever, and hydrophobia, among other diseases. In the plant world, bacteria cause black rot of cabbage, scab and wilt of potato, crown gall of roses, fire blight of pear, leaf spot of barberry, and numerous other diseases that maim and destroy useful plants.

How to Kill Bacteria. Strong sunlight is a powerful germ killer, provided it acts long enough. Since it is the ultra-violet light that has the destroying effect, the sun's power is lessened when it passes through glass; it is therefore best to sun things out-of-doors. Freezing and drying are uncertain methods of killing bacteria, for the organisms supposedly dead may be only dormant. Heat, especially moist heat, is destructive to bacteria. Boiling milk or water and cooking meats and vegetables are sure methods of preventing infection. For this reason, health authorities always warn people to boil their drinking water if the source of supply has been infected in some way. As a rule, milk which has been carefully handled from the start need not be boiled so long that its character and taste are affected, as ordinary germs are destroyed with moderate heat. Long-continued boiling, however, which greatly changes both its taste and nutritive qualities, is the only sure way of rendering milk absolutely sterile [see MILK (Care of Milk)]. In the preservation of foods by canning, the principle of sterilizing is applied with positive results. When placed in airtight containers, canned foods keep indefinitely.

There are various chemicals that kill or arrest the growth of bacteria, and these have a vitally important place in medical practice, surgery, and sanitation. Were it not for these antiseptics and disinfectants, as they are called, the death rates in civilized countries would be much higher than they are.

Bacteriology. Bacteriology is the study of the character, development, and effects of bacterial growth, with especial reference to human diseases caused by them. When bacteria are to be studied, they may be placed in a flask containing some nourishing substance, which must be absolutely free from other germs. The different kinds of bacteria flourish on different substances—for example, blood, potatoes, gelatin, and bouillon—and the material must be chosen for the bacteria under consideration.

After this nourishing material or medium is prepared, and before the bacteria are inserted, it must be sterilized. For this purpose, it is usually exposed to live steam for half an hour or more on several days in succession. When the medium is finally ready, the bacteria are placed in the flask, and this is kept at the proper temperature for bacterial growth. The bacteria are then held motionless in the cold gelatin, or whatever the medium may be. Minute specks of bacteria will be seen on the surface of the gelatin. Each speck is a colony of bacteria, and each colony includes only bacteria of a single species. By transferring one of these colonies to another medium, it is possible to raise additional colonies of these bacteria indefinitely. These specks, or colonies, are usually so tiny that it is impossible at first to transfer one and only one. After several such transfers, the bacteriologist succeeds in getting a growth which is free from all life except the bacteria of a single species. This growth is a "pure culture."

So minute are many bacteria that no microscope is powerful enough to show differences between them. They all have peculiarities of development, however, which can be studied in pure cultures. For study with microscopes, bacteria are usually placed on a glass slide and covered with a piece of thin glass. Some bacteria are stained, for experiment or for purposes of diagnosis, to bring out their peculiarities; the tuberculosis germs, for example, can be recognized only by their reaction to certain stains. These germs are determined in the following manner: A suspected specimen is stained with a strong solution of a red dye called fuchsin, to which carbolie acid has been added. After staining, the specimen is washed in dilute acid, by means of which the stain is extracted from all other bacteria. Notwithstanding the action of the acid, the tuberculosis bacilli retain the red stain, and are thus differentiated.

A very important phase of bacteriology is the use of bacterial cultures in preventive medicine. It is a well-known fact that scarlet fever, smallpox, measles, typhoid fever, and some other diseases rarely attack the same person twice. The reason is that during the course of the ailment the body acquires an immunity to the germs that cause these diseases. That artificial immunity may be acquired through vaccination and inoculation with bacterial preparations is a discovery to which man owes his control of epidemics.

The first man who actually saw bacteria was a Dutch microscope maker named Anton van Leeuwenhoek, who wrote about his discovery of "little animals" in 1683. The father of bacteriology was the French chemist Louis Pasteur (1822-1895), whom many Frenchmen justly regard as the greatest man their nation

Some Facts About Bacteria and Some Questions

1. Bacteria belong to the vegetable kingdom.
2. Each is composed of a single cell.
3. They are small in size, averaging about three microns in length.
4. They vary in shape.
5. They are living objects, having the ability to grow, multiply, feed, and to secrete.
6. According to their shape they are divided into such groups as—
 - (a) Cocci—round in shape. Illustrations: streptococci, growing in chains (the cause of erysipelas, sore throat, and scarlet fever); staphylococci: growing in bunches (the cause of boils); diplococci (growing in pairs).
 - (b) Bacilli—rod-shaped (causing such diseases as typhoid fever, tuberculosis, and diphtheria).
 - (c) Spirilla—more or less spiral (causing cholera, relapsing fever, syphilis).
7. Biologically bacteria are divided into —
 - (a) Pathogenic or producers of disease.
 - (b) Parasites, which live on other bodies but do not necessarily cause disease.
 - (c) Saprophytes, which live in dead matter and are not the cause of disease.
8. According to whether they can move or not they are divided into—
 - (a) Motile.
 - (b) Non motile.
9. According as they require air or not, bacteria are divided into—
 - (a) Aerobic
 - (b) Anaerobic
10. Among the types of activity of bacteria are—
 - (a) Production of disease (the pathogenic bacteria).
 - (b) The breaking down of nitrogenous matter to form offensive compounds (putrefaction).
 - (c) The breaking down of carbohydrate matter in the presence of ample oxygen to form carbonic-acid fermentation.
 - (d) Effects on the soil.
 - (e) Fixing of nitrogen.
11. Bacteria may be killed by—
 - (a) Light, especially sunlight and ultra-violet light.
 - (b) Heat, and especially moist heat.
 - (c) Drying and exposure to air.
 - (d) Chemical disinfectants and antiseptics.

Questions

What do the bacteria that cause typhoid fever look like?

Why does not milk taste the same after it has stood for several days?

Can all kinds of bacteria be grown in the same substance?

What characteristics led scientists to suppose at first that bacteria were animal organisms?

May different kinds live together in a single colony?

What advantage has the back yard over the sun-parlor as a place for sunning things?

How does the bacteriologist examine bacteria too small to be seen through the microscope?

How are bacteria specimens mounted for study?

What method may be used to render milk perfectly sterile?

The study of bacteria causing human diseases is called what?

What methods of studying these organisms are used?

What means of getting a "pure culture" are used?

What are ways of determining the kind of a germ?

Who first saw a germ and called it a "little animal"?

has ever produced. Since Pasteur's time, the scientists of all progressive nations have made valuable contributions to this branch of learning which so vitally affects the welfare of mankind, and touches human life at so many points.

W.A.E.

Related Subjects. The reader will find valuable information supplementary to the foregoing in the articles listed below:

Antiseptic	Immunity
Antitoxin	Inoculation
Biology	Lister, Joseph
Cold Storage	Microscope
Disease (with list)	Nitrogen
Disinfectants	Pasteur, Louis
Fermentation	Putrefaction
Filter	Refrigeration
Food Products,	Serum Therapy
Preservation of	Vaccination

BADEN, *bah'den*, a former grand duchy of the German Empire, is now a state of the imperial German republic. It lies on the east bank of the Rhine, touching Lake Constance and bordered by Switzerland on the south and Alsace on the west.

In size, Baden is the fourth state, and in population usually the fifth state, in the German republic. Its area of 5,817 square miles is slightly less than that of Rhode Island and Connecticut; its population of 2,400,000 is only about two-thirds of the pop-

ulation of the city of Chicago. It is traversed by the lofty plateau of the Black Forest (which see).

Coal, iron, zinc, nickel, and copper are mined in many places, and the fertile soil yields abun-



THE FORMER GRAND DUCHY

Baden is shown as the black southwestern area in Germany.

dant crops of wheat, barley, corn, potatoes, flax, hemp, beetroot, and tobacco. Grapes are extensively cultivated, and Baden is noted for its light wines. The chief manufactures are textiles, tobacco, chemicals, machinery, jewels, pottery, musical instruments, wooden carvings, and toys.

The capital is Karlsruhe, with a population of 146,000; other important towns are Mannheim (250,000), Freiburg (91,000), Pforzheim (80,000), and Heidelberg (75,000), the seat of the oldest university of Germany. The mineral springs of Baden are famous throughout the world [see GERMANY (Principal Cities)].

Baden became part of the German Empire in 1871. In 1918 the empire was succeeded by the new German republic, and in 1919 the Constitution proclaimed the Free State of Baden a republic, and a component state of Germany. Suffrage is granted to all citizens. There is a President and a Minister of Justice, who is also the president of the Cabinet, nominated by the one chamber, the *Landtag*. The members of the *Landtag* are elected for four years.

BADEN - POWELL, ROBERT STEVENSON SMITH (1857-), a British general who acquired distinction through a brilliant military career, but who is known chiefly through his keen interest in the Boy Scout movement. He entered the army in 1876 and served in India, Afghanistan, and South Africa. He was distinguished as commander of the native troops in Ashantee in 1895, and later in the Matabele campaign. During the South African War, his force of 1,200 men was besieged for 215 days by a large Boer army at Mafeking,

and despite famine and sickness, succeeded in repelling his assailants until he was relieved. Because of his success in defending the place, he was promoted to the rank of major general.

General Baden-Powell has always taken a keen interest in the welfare of boys, and his wide experience and ready understanding admirably qualify him as an ideal for, and a leader of, boys of all ages. He was the organizer of the Boy Scout movement in England, and in America was accounted the most conspicuous leader of the Scouts throughout the world. His works on scouting are authoritative and are widely read. See *BOY SCOUTS*; *SOUTH AFRICAN WAR*; *GIRL SCOUTS*.

BADGER, *baj'ur*, a fur-bearing animal belonging to the same family as the weasels, skunks, otters, and martens. Badgers are native to Europe, Asia, and North America. The American badger is now found chiefly in the dry plains of the West, from Mexico northward into Canada, having almost disappeared from the prairie states, where it was formerly abundant. Wisconsin is called the "Badger State" (for explanation, see *WISCONSIN*).

The badger has a flat, squat body about two feet long, covered with loose fur which has a grayish effect, being a blending of black with



THE BADGER

white, gray, or tawny. The legs are thick and strong, the feet large, and armed with long, sharp claws. The front ones are excellent digging tools, and the badger is adept not only at digging its own burrows, but at laying open the holes of squirrels, field mice, gophers, and other burrowing rodents on which it feeds. Although a plucky fighter when cornered, the badger prefers not to fight, and if it finds itself in danger away from its burrow, it is apt to flatten out on the ground and trust to protective coloration. Its squat, grayish body is easily lost to sight in the tall grass of the plains. Badgers usually remain in their holes by day and do their prowling at night. In Canada they sleep straight through the winter (see *HIBERNATION*). The flesh of badgers is not considered edible, but their pelts are found in the fur markets, and their long hairs are used to make artists' brushes.

[The term *badgering*, in the sense of *worrying*, is derived from a cruel sport formerly practiced in America and England. A pack of dogs would be forced to harass a badger in a barrel, out of which they would try to drag him. This pastime was hard on both the dogs and their victim.] M.J.H.

Scientific Names. Badgers belong to the family *Mustelidae*. The American badger is classed as *Taxidea americana*; the European, as *Meles taxus*.

"BADGER STATE." See BADGER; WISCONSIN.

BAD LANDS, a name applied in the United States to certain lands which have been greatly eroded by rain and floods (see EROSION). The most striking example of such erosive action is found in the upper drainage basin of the Missouri River, near the Black Hills. There the soil is not protected by vegetation. It is composed of sand, gravel, and horizontal strata of clay and limestone, and the hills are easily washed by rain into fantastic gullies.

There is in the minds of some people a belief that the vicinity was so named because of the wild and vicious character of some of the early miners, hunters, and adventurers. This is untrue; but the Sioux Indians, in their wars against the United States, found natural fortresses in the hills and valleys, and thus made more stubborn their resistance to authority; this fact probably emphasized the error above noted.

The section is noted for the great variety of fossil remains found there (see FOSSIL). R.H.W.

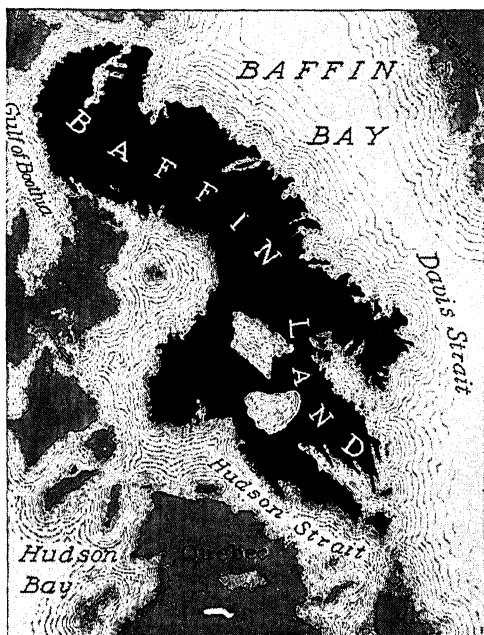
Derivation. Bad Lands is a literal translation of *Terres Mauvaises*, the name first given to these regions by French-Canadian trappers.

BADMINTON. See BATTLEDORE AND SHUTTLECOCK.

BAEDEKER, *bed' e kur*, KARL (1801-1859), a German publisher, born in Essen, whose travelers' handbooks, called *Baedekers*, for the use of tourists, have become famous the world over. He began as a bookseller of Coblenz in 1827, and twelve years later issued the first of his series of travel books, these being devoted to Belgium and Holland. The collection now includes all the European countries and portions of North America and the Orient. Each volume is provided with good maps, and the books are always accurate to the date of publication. Since 1872 the firm has had its central offices in Leipzig.

BAFFIN, WILLIAM. See below; also see ELLESMERE LAND; NORTHWEST PASSAGE.

BAFFIN LAND AND BAFFIN BAY, an island and bay in the Arctic regions to the west of Greenland, named after the English navigator, William Baffin (see below). The area of the island is not accurately known, but it is estimated at about 236,000 square miles, making it the fourth largest island in the world; yet it is one of the least valuable. It is inhabited



BAFFIN LAND AND BAFFIN BAY

by a few Eskimos, and is barren and of inhospitable aspect. In 1911, Bernard Hantzsch, who had spent a year in its exploration, died there, after completing the most reliable maps and surveys yet obtained.

Baffin Bay, separating the island from Greenland, is about 800 miles long, with an average breadth of 280 miles, and was first explored by Baffin in 1615. The bay is seldom free from ice, though open for a short time during the hottest time of the year. On the shores, which are high and rocky, are a few Eskimo and Danish settlements. The black whale, walrus, and seal are found in the bay; and bears, foxes, and hares are numerous in the surrounding territory.

William Baffin, English navigator and explorer, was born about 1584. Having a fondness for the sea,



Photo: Visual Education Service

IN BAFFIN LAND
Eskimo woman in her best dress of fur and leather.

he visited Greenland in 1612, again in 1615, and also made voyages to Spitsbergen in 1613 and 1614, all before he was thirty years old. After his Arctic explorations, he entered the service of the East India Company, and in 1622 was killed while leading an expedition to drive the Portuguese out of Ormuz, in the Persian Gulf.

BAGASSE, *ba gahs'*. See LOUISIANA (manufactures).

BAGDAD, before 1923 the form of spelling for Baghdad. See IRAQ (The Cities).

BAGHDAD, formerly spelled BAGDAD. See IRAQ.

BAGPIPE, a musical wind instrument, now regarded as the national instrument of Scotland. It consists of a leather bag, into which air is blown through a pipe. Holding the bag under his left arm, the performer forces air into four other pipes by pressure of his elbow. In the Highland form, one pipe, called the *chanter*, plays the melody; of the other three, called *drones*, two emit a monotone in unison with the lowest note of the chanter, and the third gives forth a note an octave lower. The notes from the chanter are produced by means of holes, stopped with the fingers, or left open, as in playing a flute.

The bagpipe is of great antiquity, having been used by the ancient Greeks, and it is popular among the country people of Poland, Italy, France, and Ireland. Scotland is by no means its original home, for it is thought to have been introduced into that country after William the Conqueror entered England in 1066.

BAHAMA ISLANDS, a group of British West Indian islands lying northeast of Cuba and southeast of the coast of Florida. They are formed largely of wind-blown coral sand. The principal islands are Grand Bahama, Great Abaco, Little Abaco, Andros Islands, New Providence, Eleuthera, Great Exuma, San Salvador, Acklin's Island, and Great Inagua. Of the whole group, which numbers over 3,000 islands and reefs, twenty are inhabited. The most populous is New Provi-

dence, which contains the capital, Nassau (population of town and island, 13,000). The principal exports are sisal, sponges, tomatoes, and pineapples.

The Bahamas are a favorite resort for invalids suffering from pulmonary diseases. After 1920, there was much illicit trade in liquors between the islands and Florida coast cities. The first British settlement was made on New Providence toward the close of the seventeenth century. San Salvador, or Watling Island, is thought by some authorities to be the same as Guanahani, the land first touched on by Columbus in 1492. Population of the group, 55,000; area, 4,404 square miles.

BAHIA, *bah e' ah*. See BRAZIL (The Cities).

BAHIA BLANCA, *bah e' ah blahnng' kah*. See ARGENTINA (The Cities).

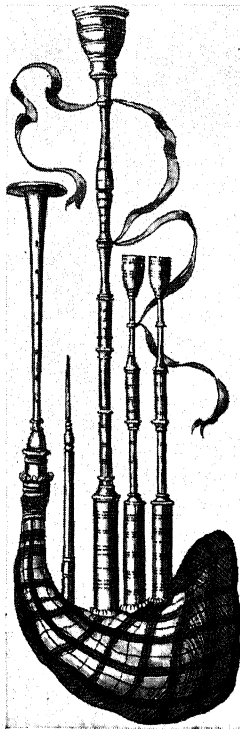
BAIKAL, *bi kahl'*, the largest fresh-water lake in Asia, situated in Southern Siberia, covering an area of 13,200 square miles, which is more than ten times the size of the state of Rhode Island. It is surrounded by lofty and rugged mountains. The deepest recorded sounding is 4,997 feet, making it the deepest fresh-water lake in the world. It is frozen over from December to April, and traffic is then conducted by sleighs. During the Russian-Japanese War (1904-1905), a railroad was constructed over the frozen surface of the lake for the conveyance of troops and supplies. The route of the Trans-Siberian railway skirts the southern shore, a new route having been opened in 1905. The salmon, sturgeon, and seal fisheries are valuable, and many oil wells are found in the vicinity. Over 300 rivers, mostly mountain torrents, empty themselves into Lake Baikal, the surplus waters being carried off by the Lower Angara, a tributary of the Yenisei River.

Related Subjects. For location on the map, see ASIA; for comparison with other lakes as to size, see illustration, article LAKE.

BAIL, a legal term applied to the property or surety which one person pledges as the security for another under arrest, that the latter may enjoy his liberty until the date of trial. Bondsmen, those whose pledges are accepted as bail, must be owners of unencumbered real property in value usually double the amount required in the bond, and must be citizens residing within the jurisdiction of the court. The responsibility of a bondsman ceases if the person is rearrested upon his complaint. A person accused of wilful murder cannot apply for temporary liberty on bail bonds. See ARREST.

BAILEY, LIBERTY HYDE. See AGRICULTURAL EDUCATION.

BAILIFF, a peace officer attached to a court, charged with preservation of decorum during court sessions, and at times with the service



THE BAGPIPE

of papers upon litigants by order of the court. Bailiffs are not in all states a part of the court personnel.

BAINBRIDGE, WILLIAM (1774-1833), one of the few American naval officers who have been voted gold medals by Congress for distinguished services. He entered the United



Photo: Brown Bros.

WILLIAM BAINBRIDGE

Shown in uniform of the United States navy at the beginning of the nineteenth century. The cannon was one of the best of its type of that period.

States navy in 1798 as a lieutenant. Two years later he commanded the frigate *George Washington*, which carried to Algiers the tribute the United States was required to pay the Barbary pirates for commercial privileges in the Mediterranean. Under Commodore Preble, he commanded the frigate *Philadelphia* during the war with Tripoli, which put down the Barbary piracy. While chasing a blockade runner in 1803, his vessel grounded and was forced to surrender, the captain and his 300 men being held as prisoners for over a year. See **BARBARY STATES**.

In 1812 he commanded a squadron comprising the *Constitution*, *Essex*, and *Hornet*, and later in the year captured the British frigate *Java* after a two hours' engagement, in which the British lost 300 in killed and wounded, the Americans, thirty-four. It was for this achievement that Congress voted the commodore a gold medal, and in addition voted his crew \$50,000 as prize money. In 1815 and in 1821,

Bainbridge commanded the Mediterranean squadron, his last foreign assignments.

BAIRD MOUNTAINS. See **ALASKA** (Physical Characteristics).

BAIRNSFATHER, BRUCE (1887-), an English cartoonist whose pencil portrayed what little humor the World War developed in a series of cartoons in which Old Bill, a rude philosopher with buoyant spirit, was the central figure. A very popular stage play and a moving picture, both named *The Better 'Ole*, were based on the Bairnsfather series. Through it ran Old Bill's advice to those prone to complain of discomforts in the trenches, "If you can find a better 'ole, 'op to it."

Bairnsfather went to France in 1914 as a soldier, and served in the trenches until 1916, when he was withdrawn from the ranks in order that by his art he might help to maintain the morale of the troops. In 1919 he began the publication of *Fragments*, a weekly humorous paper.

BAKELITE, *ba' keh lyte*. Collar buttons, fountain pens, pipe stems, and billiard balls; radio equipment, airplane propellers, transmission gears, and grinding wheels; a water-proof and heat-proof varnish; automobile equipment, jewelry—all of these things and scores of others are made from a synthetic plastic known by the trade name of *bakelite*. As ordinarily used, when mixed with fibrous materials, bakelite is black or brown; in its natural state, it is clear or amber-colored, and transparent, like the natural resins it was designed to imitate.

Bakelite takes its name from its inventor, Dr. L. H. Backeland, a chemist who in 1909 published his researches in the fields of synthetic resins. The product is made by the combination of phenol (carbolic acid) and formaldehyde, a reaction which produces a substance much like natural resin; it is brittle, soluble in resin solvents, and easily melted. In this stage it may be put into solution, to form a quick-hardening, moisture-proof varnish or cement; or it may be molded to any shape and submitted to heat and pressure, which will make it extremely hard and impervious to moisture or rise in temperature. These properties, and the fact that it is a non-conductor, make it very important for insulation, for machine parts where friction occurs, and for jewelry or ornamental articles where a high polish is desired. Apparently, the ever-widening scope of usefulness for bakelite is limited only by the cost of the chemicals of which it is made.

[In the article **CHEMISTRY**, see the division *Contributions of Chemistry to Human Welfare*.]

BAKER, NEWTON DIEHL (1871-), an American lawyer who, though an advocate of pacifism, became Secretary of War in the

Cabinet of President Wilson and held that office through the trying years of the World War, the greatest conflict of nations in all history. He was born in Martinsburg, W. Va., was graduated at Johns Hopkins and Washington and Lee universities (1892 and 1894), and then began the practice of law in his home city. Later moving to Cleveland, O., he was city solicitor from 1902 to 1912, and mayor of the city for two terms (1912-1916). He then went to Washington as Secretary of War. In 1921 he resumed his law practice in Cleveland. See WORLD WAR.

BAKER, RAY STANNARD (1870-), an American author, editor, and publicist whose diversified work raised him to a high place among his contemporaries. His rise to fame may have been through a series of magazine articles dealing with social, political, and economic conditions in cities and states, but in the literary field his "David Grayson" stories added greatly to the number of his admirers.

Baker was born in Lansing, Mich., was educated at the Michigan Agricultural College and the University of Michigan, and early turned to journalism, first as reporter on the *Chicago Record*, later rising to magazine editorship. He managed the McClure syndicate for the sale of manuscripts, was editor of *McClure's Magazine* (1899-1905) and of the *American Magazine* (1906-1915), after which he was drafted by President Wilson as a special commissioner of the Department of State to the countries of Europe allied in the war. At the Peace Conference in Paris in 1919, he was the head of the press bureau of the American commission. He was selected as President Wilson's official biographer.

His Literary Work. Baker's first book, *Boys' Book of Inventions*, was published in 1899. In quick succession followed *Our New Prosperity, Seen in Germany*, *Second Boys' Book of Inventions*, *Following the Color Line*, *New Ideals in Healing*, *The Spiritual Unrest*, *What Wilson Did at Paris*, *The New Industrial Unrest*, *Woodrow Wilson and World Settlement*, and *History of the Peace Conference*.

A series of restful, tranquil sketches and stories under the pen name of "David Grayson" added much to Baker's reputation. Among these were *Adventures in Contentment* and *Adventures in Friendship*, and a novel, *Hempfield*.

BAKERSFIELD, CALIF. See CALIFORNIA (back of map).

BAKER UNIVERSITY. See KANSAS (Education).

BAKING POWDER, a fine, white powder which the housewife uses in place of yeast to "raise" bread, biscuits, and other preparations of flour or meal. The baking powder of best quality is made of cream of tartar and soda, mixed with starch or flour. The starch or flour keeps the soda and cream of tartar dry,

and thus prevents their acting upon each other until ready for use. As soon as the baking powder is wet, the cream of tartar attacks the soda and sets free carbonic-acid gas. The gas, passing through the dough, makes it light and porous, and it "rises." Soda and sour milk have the same effect as baking powder.

Cheaper baking powders are made by using alum or acid phosphate of lime, or both, in place of the cream of tartar. As a food constituent, alum has always been regarded with suspicion, but investigations by the Referee Board of Consulting Scientific Experts of the United States Department of Agriculture failed to reveal any injurious effects due to alum baking powders in the quantities used in an ordinary diet. However, they advised against the excessive use of foods made with baking powders, since all the commercial kinds leave substances in the bread which in large doses affect the bowels. See ADULTERATION OF FOODSTUFFS AND CLOTHING. E.V.M'C.

BAKU, *ba koo'*, capital of Azerbaijan (which see).

BALAAM, *ba' lam*, a soothsayer and seer whom Balak, king of Moab, called upon to curse the Israelites when they were about to overrun his country. The first time the demand was made, the Lord commanded Balaam not to go to meet the enemy, but the second time permission was given, with the command that Balaam was to do whatever the Lord commanded. On the way, the angel of the Lord appeared before him with a drawn sword in his hand. By a miracle, the ass which Balaam was riding saw the angel, but Balaam could not see him. The ass turned aside into the field, and Balaam struck her to force her back into the path. But the angel was still in front of the ass, and she still resisted, finally lying down under her master, and Balaam smote her the third time. The ass was then made to speak, and Balaam replied: "Because thou hast mocked me, I would there were a sword in mine hand, for now I would kill thee." The narrative continues: "Then the Lord opened the eyes of Balaam, and he saw the angel of the Lord standing in the way with his sword drawn, and he bowed down his head and fell flat on his face." Under the command of the Lord, Balaam blessed the Israelites four times, and his prophecies are among the most impressive in the Bible. See *Numbers* XXII-XXIV.

BALAKLAVA, *bah lah klah' vah*, BATTLE OF, fought on Oct. 25, 1854, between the Russian field army and the allied English, French, and Turkish troops, in the Crimea. Through a misunderstanding, an English brigade of light cavalry, numbering about 600 men, was ordered to charge the Russian cavalry stationed at the end of a long valley, the ridges on both sides of which were also held by the enemy's in-

fantry and cavalry. At the word of command, the "Light Brigade" swept down the plain, exposed to a deadly fire from the front and both sides, and only a remnant found their way back. See CRIMEAN WAR.

This heroic charge inspired the stirring poem to which its author, Alfred Tennyson, gave the title, *The Charge of the Light Brigade*. One of the stanzas is here given:

Forward, the Light Brigade!
Was there a man dismayed?
Not though the soldier knew
Someone had blundered:
Theirs not to make reply,
Theirs not to reason why,
Theirs but to do and die:
Into the valley of Death
Rode the six hundred.

The city of Balaklava is situated on the Crimean coast of the Black Sea, about eight miles southeast of Sebastopol (formerly Sevastopol). Its harbor is shut in by lofty hills, and the entrance is so narrow that scarcely more than one vessel can enter at a time. On the heights overlooking the bay are the houses of the inhabitants, mostly Greek fishermen, who number about 1,500.



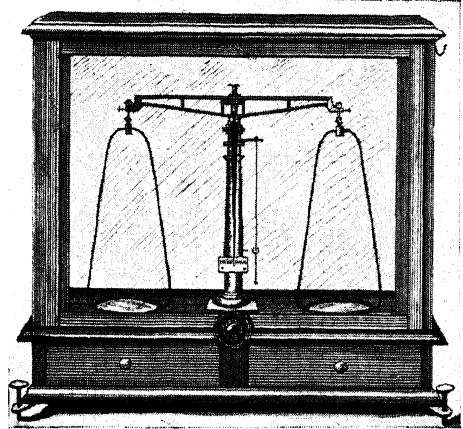
THE CRIMEAN PENINSULA

Locating the spot made famous by the "Light Brigade."

BALANCE, a mechanical device for weighing substances, from very tiny particles of matter to great masses of the heaviest materials. The simplest form of weighing machine is called a *spring balance*, which is not really a balance in the true sense of the word. In this device, the goods to be weighed are placed in a pan which is suspended from, or presses on, a spring. The weight causes the spring to expand or close, forcing a needle or indicator into position on a dial, which is marked off in spaces indicating pounds and ounces. This form of balance is sufficiently correct for measuring meat and groceries, but is not so delicately adjusted as to measure

drugs for medicine or other substances requiring the utmost accuracy.

The true balance consists of a horizontal arm, from each end of which a pan is suspended. The arm is perfectly balanced across a knife edge of metal or other hard substance. In one



THE TRUE BALANCE

of the pans is placed a weight; in the other, the substance to be weighed. When the weights in the two pans exactly correspond, the arm of the balance remains horizontal. If the weights are uneven, one side of the arm will rise. Balances are made with such delicate adjustment that they will indicate the weight of a human hair; these are enclosed in a glass case to protect them from dust and prevent corrosion from the atmosphere. The Romans and Egyptians used a balance that is still employed; it is known as a *steelyard* (which see). See, also, **WEIGHING SCALE**.

BALANCE OF POWER, the condition which exists among nations when no one power or dynasty or group of states is sufficiently powerful to endanger the independence of other nations or groups. The principle involved is as old as history, for it is nothing more or less than the law of self-preservation, expressed in diplomatic terms. If one nation, or a group of nations, becomes so powerful as to threaten the independent existence of less powerful neighbors, it is natural for the latter to form new and more powerful alliances in self-defense, and thus restore the balance wherein lies safety. Even primitive tribes have been known to unite forces against an aggressor.

While the principle is thus as old as history, it is only in modern times that it has become one of the fundamental doctrines of diplomacy, recognized by international law. Obviously, if any nation can impose its will on weaker countries, there is an end to international law, for in such case the will of the strongest is law.

According to Grotius and later writers, it has been held to be the duty of every nation to interfere, even at the cost of war, when any member of the family of nations tries to disturb the balance.

Wars have been waged to preserve the balance of power as often as they have been waged to destroy it. Between 1648 and the fall of Napoleon in 1815, Europe was almost continuously at war, the preservation of the balance of power being the customary excuse for the endless rearrangement of alliances. The great coalition against Napoleon was one more attempt to secure the same end.

After Napoleon's fall, the theory still held its place in Europe's diplomacy. To this theory and to the diplomacy of Talleyrand, France owed the favorable treatment it received at the hands of the Congress at Vienna in 1815. When Russian ambitions for expansion threatened the theory, Great Britain and France fought the Crimean War to save it. The formation of the Triple Alliance, between the German Empire, Austria-Hungary, and Italy, was followed by the Dual Entente, later the Triple Entente (which see), to offset the predominance of Germany in European politics. This balance of power was, therefore, one of the underlying causes of the World War, which began in 1914.

To end war for all the future, at the conclusion of the World War over fifty nations accepted the Woodrow Wilson proposal to establish the League of Nations, the Covenant of which would seem to outlaw war definitely and make unnecessary the age-old struggle to maintain balance of power anywhere. The Permanent Court of International Justice was also set up as a tribunal to which nations could bring their international grievances. No severe test of the sufficiency of these diplomatic machines has since arisen, but new coalitions have been made and new treaties have been signed to maintain powerful alliances, as of old. In 1928 fifteen nations signed an agreement in Paris which was designed forever to outlaw war.

Related Subjects. The reader is referred in these volumes to the following articles:

Grotius, Hugo	Triple Alliance
League of Nations	Triple Entente
Permanent Court	Vienna, Congress of

BALANCE OF TRADE, in economics, is the excess of exports over imports, or vice versa, in a country. If the exports are larger, the balance is said to be *favorable*; if the imports exceed the exports in value, the balance is *unfavorable*. The phrase first came into common use in the seventeenth and eighteenth centuries, in connection with the "mercantile theory," which measured the prosperity of a country by the amount of actual gold and silver it received or paid out for this excess.

It was then believed that no country was prosperous unless it received in cash more than it paid to other countries.

If the buying and selling commodities were the only factors in creating a balance of trade, this doctrine would be sound. But as Adam Smith pointed out in 1776, money is merely a commodity which obeys the same laws of supply and demand as do dry goods, for instance. There are, moreover, transportation and commission charges, citizens' investments abroad, and local investments by foreigners, and other factors which should be included in a true balance of trade. As these factors cannot be accurately measured, the theory is no longer fully accepted.

The balance of trade is still, however, a popular though inaccurate index of a country's prosperity. Campaign orators sometimes present it as an issue which is declared to be the chief factor in the prosperity of the country. A comparatively new country, such as Canada or the United States, usually shows a favorable balance of trade; its exports are larger than imports, and money comes in freely. As a matter of fact, the balance is really often unfavorable, for much of the money is coming for investment and is balanced by bonds and other evidences of debt which do not appear in the trade balance. F.H.E.

BALBOA, *bal bo' ah*, VASCO NUNEZ DE (1475-1517), the first European who looked upon the waters of the Pacific Ocean from America's shores. Having dissipated his fortune in Spain, he sailed to America, and was at Darien in 1510. An insurrection placed him at the head of the colony, and he immediately began a search for the famous land of gold and the great western ocean of which the Indians had told him. On Sept. 25, 1513, having reached the top of the mountains, he saw for the first time the Pacific, and five days later he stood upon the shore and claimed the new-found water and all the lands whose shores it washed, in the name of the king of Spain. He little realized the vastness of that domain.

Returning to Darien, he found himself supplanted by a new governor, Davila, and anger and jealousy at once arose on both sides. Balboa submitted, and Davila apparently became reconciled to him, but shortly afterward had him beheaded on a charge of intent to rebel. See illustration, p. 577.

BALBOA, a coin of Panama. See MONEY (Foreign Monetary Standards).

BALDER, *baul' dur*, in Norse mythology, was the god who personified the sun and the charm of summer. He was the son of Odin and Frigga, and was a general favorite with the gods and goddesses because of his beauty and goodness. His one enemy was the wicked Lok, or Loki, who hated him and plotted his destruction. Balder's mother, fearing that

he might be harmed, had exacted from all the things in the world, save only a small spray of mistletoe that grew on an oak tree, a promise that they would not injure her son. The gods, therefore, made a pastime of hurling their dangerous weapons at Balder, that they might enjoy the sport of seeing them fall harmlessly to the ground. But the scheming Loki made a dart from the mistletoe, and this he put into the hand of Balder's blind brother, telling him how to throw it. As the dart struck Balder, he fell dead.

In Literature. The death and funeral of the god, and his journey to the underworld, form the theme of a beautiful poem by Matthew Arnold, entitled *Balder Dead*.

Related Subjects. The reader is referred in these volumes to the following articles:

Frigga	Odin
Lok	Mistletoe
Mythology	

BALDNESS, a term referring to absence of hair on the head. *Partial* baldness is a thinning of the hair; *area* baldness is absence of hair from areas that are normally covered by hair; *senile* baldness is the thinning of hair which occurs in old men, and sometimes in old women. This form of partial baldness generally shows itself after fifty years of age. It is characterized by a tendency of the hair line to recede, with a gradual thinning of the hair over the head generally, but with some tendency to exaggeration on areas.

The more frequent form of baldness is that which develops in younger people and which may be apparent before maturity. As a general proposition, it proceeds unevenly, certain areas becoming nearly bald, while over the remainder of the scalp the stand of hair and its quality continue to be good. This tendency is responsible for the term *pattern* baldness.

Causes. There are several causes of baldness. Among them is inheritance. Men inherit a tendency to become bald prematurely. The pattern of the bald spot likewise tends to be inherited. The women of a bald family are somewhat liable to develop baldness; they are more likely to retain their own hair but to

pass on the inherited trait, even to the pattern, to their sons.

Compression of the skin and soft parts of the scalp by wearing tight hats or heavy hats is a second cause of baldness. The fact that women do not wear constricting hats is one reason assigned for their lessened tendency to baldness. Neglect of cleanliness of the scalp is a third reason for baldness. People who wash the scalp frequently and brush the hair vigorously every day seldom become prematurely bald. W.A.E.

BALDPATE, one of the ducks (which see); see, also, **WIDGEON**.

BALDWIN, CURTIS C. See **THRASHING MACHINE**.

BALDWIN, MATTHIAS WILLIAM (1795-1866). "The locomotive-engine, built by M. W. Baldwin, of this city, will depart daily, when the weather is fair, with a train of passenger-cars. On rainy days horses will be attached." This unique advertisement, which appeared in a Philadelphia paper in November, 1832, referred to *Old Ironsides*, one of the earliest American-made locomotives, and the first to draw a train in the state of Pennsylvania.

Baldwin, its builder, had been apprenticed to the jewelry trade, and while quite young had invented a simplified process of gold-plating.

He graduated into the manufacture of bookbinders' tools, and later revolutionized the calico-printing industry by the invention of cylinders operated by steam power. Then, since the six-horse-power engine which he had designed for his own shop was proving so satisfactory, he launched out into the manufacture of stationary engines for the trade.

About this time, people were becoming curious about the wonderful locomotives made in England by the Stephensons and others, some of which were being brought to America. As a business-getting novelty, the owner of a museum in Philadelphia ordered from Baldwin in 1831 a small working model of a train drawn by a locomotive. This consisted of an engine and two cars, each accommodating two passengers, and the tour of the museum was made over a circular track. The



Photo: Wide World

TO THE MEMORY OF BALBOA

This statue, erected in Panama in 1925, is regarded as one of the finest in the world. Beneath the bronze figure of the explorer are reliefs representing the four great races of mankind. The seals of all the Latin-American nations are on the upper pedestal, as well as images of King Alfonso of Spain and President Parras of Panama.

following year Baldwin was commissioned by the Philadelphia, Germantown & Norristown Railway to construct the practical locomotive which later figured in the announcement quoted. He had an opportunity to make notes and sketches of the unassembled parts of a Stephenson locomotive which had just been received, but he so simplified the combination scheme that *Old Ironsides* was superior to the English model. It was in active service for over twenty years.

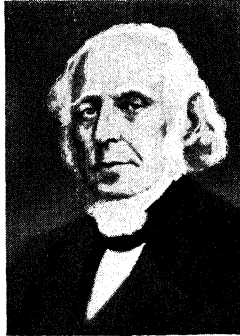
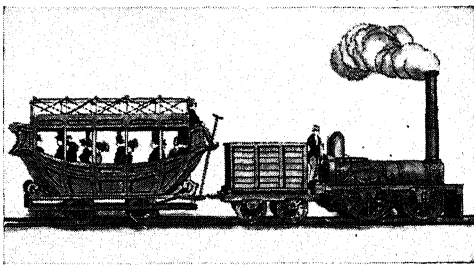


Photo: Brown Bros.

MATTHIAS BALDWIN

His second engine was made in 1833 for the South Carolina Railway, and set a type which American locomotives have followed in the main ever since. After this, many other orders



FIRST BALDWIN LOCOMOTIVE

Engine and coach of the train referred to in the first paragraph of this biography.

came to him, and he began to organize a shop along new lines; he educated workmen in the special mechanics of the locomotive, designed the tools and machinery needed, and in general laid the foundations of the industry which has grown into the famous Baldwin Locomotive Works of Philadelphia—the largest business of its kind in the world.

Related Subjects. The reader is referred in these volumes to the following articles:

Locomotive Railroad Stephenson, George

BALDWIN, STANLEY (1867-), Prime Minister of Great Britain in 1923, successor to A. Bonar Law, and again in 1924, upon the retirement of MacDonald's Labor government. At the time of his first appointment, he held the post of Chancellor of the Exchequer in the Law government. Baldwin's elevation to the highest post in the government was due partly to the fact that he is a commoner, and it was felt in all circles that the Premier should be a member of the House of Commons rather than the House of Lords, for the vital issues of the nation are really determined in the Commons.

Lord Curzon was defeated by Baldwin in his ambition to become Prime Minister largely because of this political consideration.

Baldwin's rise to power was rapid. He did not enter Parliament until 1908, and then for several years was almost unnoticed by the powerful members of the government. Not until 1917 did he receive his first notable advancement, when he was appointed Financial Secretary of the Treasury. From that post he advanced to the presidency of the Board of Trade, then to the post of Premier.

During his tenure of office, the country suffered the greatest coal strike in its history. The period was also notable for the agitation in behalf of the right to vote on the part of all women over twenty-one years of age. Baldwin favored the cause of the women. In 1929 MacDonald again succeeded Baldwin, after Labour's victory. See



Photo: U & U

STANLEY BALDWIN

LAW, A. BONAR; MACDONALD, JAMES RAMSAY.

BALEARIC, *bal e air' ik*, **ISLES** (BALEARIC in Spanish), a group of fifteen islands forming a Spanish province, situated in the Mediterranean Sea a short distance east of Spain, the largest of which are Majorca and Minorca. Their combined area is 1,935 square miles. The coasts are rugged and dangerous, but Minorca has one of the finest harbors in Europe. Vines, olives, and other fruits are cultivated, and the fisheries are valuable. The islands, excepting Minorca, were annexed to Spain in 1343. Population, 342,500.

Majorca, the largest island of the group, has about 300,000 population and an area of 1,386 square miles. There persists a belief that here was first produced the famous majolica pottery. See MAJOLICA.

Minorca, the second island in size and importance, has a population of about 41,000, and an area of 203 square miles. There are valuable deposits of iron, copper, lead, and marble. Minorca was ceded by Great Britain to Spain in 1802 in exchange for Gibraltar.

BALEEN', a suborder of whale (which see).

BALFE, *balf*, **MICHAEL WILLIAM** (1808-1870), the composer to whom the world will always be grateful for the bright and tuneful opera *The Bohemian Girl*. It contains three songs that are widely known and loved—*Heart Bowed Down, Then You'll Remember Me*, and *I Dreamt I Duelt in Marble Halls*.

Balfe was born in Dublin. He early displayed remarkable ability as a musician, playing difficult pieces for the violin at the age of

seven, and writing a ballad two years later that was sung in public. At sixteen, he joined the Drury Lane Theater orchestra, where he played the violin, and soon after went to Italy to study. In 1827, he was singing in Italian grand opera at Paris, but soon returned to Italy to take up the work of operatic composition. Of the thirty operas which he composed, the ones which have found the highest favor with the public are, besides his *Bohemian Girl*, *The Rose of Castile* and *Satanella*. Attractive music and gaiety of spirit are their chief characteristics.



Photo: Brown Bros.
MICHAEL BALFE

BALFOUR, SIR ARTHUR J. (1848-), one of the foremost of British statesmen of his generation, for more than twenty years the leader of the Conservative party in the House of Commons, which he first entered in 1874, and Prime Minister from 1902 to 1905. Even after 1912, when he retired from official leadership of the Conservatives, he still remained in many ways their chief, and he was probably the most influential private member in Parliament. In 1915, when the World War caused the formation of a coalition Cabinet under the Premiership of Asquith, he was appointed First Lord of the Admiralty, succeeding Winston Churchill; he became one of the inner council of the Cabinet, the group directly responsible for the prosecution of the war.

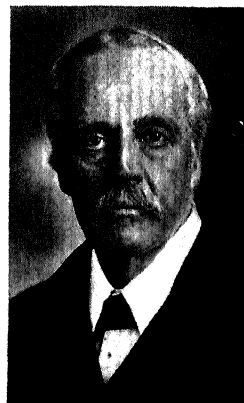


Photo: Brown Bros.
ARTHUR JAMES BALFOUR

Like many other Englishmen who have won fame in public life, Balfour first achieved distinction in literature, and in his early political career was lightly regarded. He was thought by many to be amusing himself with politics, and his somewhat languid manner only added to the popular impression.

Not until 1887, when Lord Salisbury appointed him Secretary of State for Ireland, did he have opportunity to show his worth. Previously he had served his uncle, the Marquis of Salisbury, as private secretary, and had held

some minor Cabinet positions. From 1887 to 1891, in spite of the jeers of the Irish Nationalists, he administered the duties of the Irish office with good sense, although his strict enforcement of unpopular laws caused some discontent. In 1891 he was promoted to the position of First Lord of the Treasury and Conservative leader in the Commons. These positions he held until 1902, except for the years 1892 to 1895, when he was leader of the opposition during the ministries of Gladstone and Rosebery.

As **Prime Minister**. On the resignation of Lord Salisbury, on July 11, 1902, Balfour succeeded him as Prime Minister. His succession to power practically coincided with the end of the South African War and the coronation of King Edward VII. While the war left many problems for the Ministry, a new question caused its downfall after three years and seriously disturbed the party. This question was whether or not Great Britain should abandon its historic policy of free trade. Balfour admitted the desirability of protecting British trade from unfair foreign competition, but he was opposed to the sudden and complete adoption of a protective policy such as was advocated by Joseph Chamberlain. By skilful parliamentary tactics, Balfour held his party in power until December, 1905. Balfour resigned on December 4, and was succeeded by Sir Henry Campbell-Bannerman.

After 1906, Balfour represented the city of London in Parliament. His leadership of the Conservatives and Unionists was reestablished after his defeat, and he also proved again his preeminence among parliamentarians. In 1909 and 1910, he counseled submission to the Liberal policy as shown in the famous budget submitted by Lloyd George, an action which called forth such criticism from his own party that he resigned its leadership in November, 1912. He remained in Parliament, however, and in 1915 became the leading Conservative in the coalition war Ministry. In 1917, he headed a British war delegation on a visit to the United States and the Dominion of Canada, and was enthusiastically received. For his services at the 1921 armament conference at Washington, he was knighted. He retired during 1929.

BALINE, *ba leen'*, ISRAEL, the real name of Irving Berlin (which see).

BALIOL, *ba' le ol*, or *bal' yol*, **JOHN DE** (1249-1315), king of Scotland from 1292 to 1296. He owed his succession to the throne to Edward I of England. On the death of Margaret, granddaughter of Alexander III, Baliol claimed the throne of Scotland by virtue of his descent from David, Earl of Huntingdon, brother of William the Lion. Robert Bruce, a descendant of David by another line, opposed him. Edward I, invited to settle the dispute,

decided in favor of Baliol, whom he induced to swear allegiance to him. Irritated by Edward's harsh exercise of authority, Baliol concluded a treaty with France, then at war with England, but after defeat at Dunbar in 1296, he was obliged to give up his crown to Edward. He was sent with his son to the Tower, but in 1297 obtained liberty to retire to his Norman estates. See EDWARD (I, England); SCOTLAND (History: Power of the Nobility).

BALKAN MOUNTAINS. See BULGARIA (The Land and Its Resources).

BALKAN PENINSULA, the easternmost of the peninsulas of Southern Europe, called because of the turbulent nature of its inhabitants

in Europe is also considered a part of the Balkan Peninsula.

The Balkan Peoples. The people who inhabit the peninsula are not all of one race. Besides Albanians, who are descended from the ancient Illyrians, there are several Slavic families, as well as Greeks and Turks. Yet all the Balkan peoples have certain common characteristics. Hot-tempered and quick to resent injustice, they have always been ready to turn the sword against each other. On the other hand, Greeks, Albanians, and Slavs have long been united in their enmity to the Turks. Like the Swiss and other races who have developed their national history in a mountainous country, the people of the Balkans are imbued with the spirit of liberty. For centuries they chafed under the weight of Turkish oppression, but little by little they freed their mountainous peninsula from Oriental despotism, until now Turkey rules but one very small corner of the region. The only instance of a Slav race of the Balkans becoming an ally of Turkey occurred in 1915, when Bulgaria tardily joined the Germans, Austrians, and Turks in the World War.

Since the peninsula is in a measure isolated, the inhabitants might be left to themselves, but almost inevitably other parts of Europe are drawn into their conflicts. The Balkan War (which see) was practically a local affair, but the greatest conflict of all times, the World War, had its final cause in an outbreak in one of the Balkan states.

Geographical Features. The Danube and the Save rivers form the northern boundary of the peninsula. To the extreme east is the Black Sea; to the southeast, the Sea of Marmora, the Dardanelles Channel, and the Aegean Sea, and to the west are the Adriatic and the Ionian seas. As a whole, the region is very mountainous, the chief range being that from which the peninsula takes its name, the Balkans.

Balkan Mountains. This mountain chain, the name of which means *high ridge*, is the eastern branch of the Alpine system of Central Europe. It forms the watershed between the Danube and the short, rapid rivers of the Balkan Peninsula. Beginning at the Iron Gates of the Danube, where the boundaries of Hungary, Yugoslavia, and Rumania join, it extends southward through Yugoslavia, then eastward through Bulgaria to the shores of the Black Sea. There are a number of peaks over 7,000 feet in height, the tallest reaching an altitude of 7,789, and several passes lie at heights of from 4,000 to 5,000 feet. Valuable deposits of iron, copper, and lead are found in the western part of the Balkans. E.D.F.

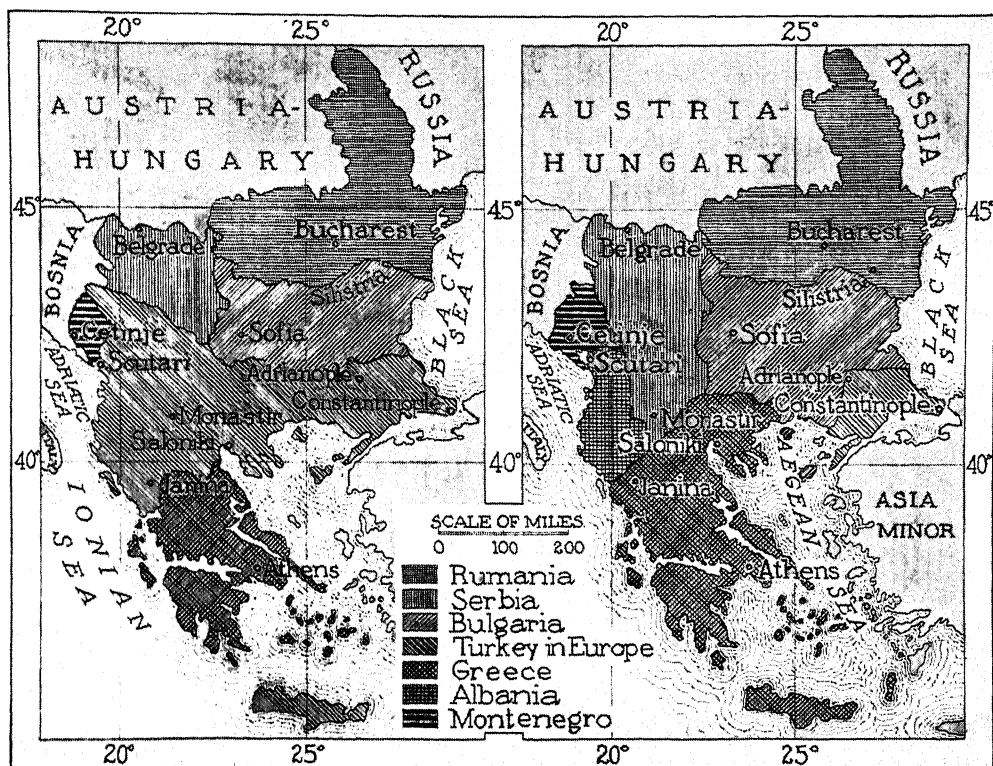
Related Subjects. The reader is referred in these volumes to each of the countries and provinces named in the above article. See, also, WORLD WAR.



BALKAN PENINSULA

An understanding of the size of the Balkan states is reached by a study of the above maps, drawn to the same scale.

the "powder magazine of Europe." It is not, like the peninsula of Italy to the westward, one nation, for within its 175,000 square miles are comprised Yugoslavia (the Kingdom of Serbs, Croats, and Slovenes), Albania, Greece, Bulgaria, and Rumania, which is politically a Balkan state though not geographically a part of the peninsula. Montenegro, Dalmatia, Bosnia, and Herzegovina now belong to Yugoslavia. The small part of Turkey which is left



BEFORE AND IMMEDIATELY AFTER THE BALKAN WARS

At the left, the boundaries of the countries before the conflicts; at right, the boundaries after peace was declared. These boundaries were further changed after the World War. (See map of Europe.)

BALKAN WARS, the wars waged in 1912-1913 by Bulgaria, Greece, Montenegro, and Serbia against Turkey, and another conflict, the outgrowth of the first, in which four Balkan states were allied against Bulgaria.

The First War. The causes of the Balkan Wars may be traced to the Turkish conquests of Europe in the fourteenth and fifteenth centuries. Thereafter, until the beginning of the nineteenth century, the Balkan Peninsula was never free from Turkish rule. The natives of the peninsula, however, retained the right of local self-government and freedom of worship; thus the desire for freedom was never weakened.

The Eastern Question. The gradual decline of Turkish power in Eastern Europe during the seventeenth and eighteenth centuries coincided with the development of strong national units in Western Europe. One by one the Balkan states, beginning with Greece in 1830 and ending with Bulgaria in 1908, declared their independence and won acknowledgment of it through pressure exerted by the Western powers upon Turkey. Yet these same powers prevented the Balkan states from attaining their ultimate ambition, the adjustment of boundaries according to nationality. Every

one of the Balkan countries, except Montenegro, ruled a large section of territory which was claimed or coveted by another, and Turkey still held Macedonia and Albania, which all of them wanted.

The Congress of Berlin established a delicate balance of interests which survived for a generation, but in 1908 and 1909 the existing condition was overturned. The successes of the Young Turks, the proclamation of Bulgaria's independence, and the annexation of Bosnia and Herzegovina by Austria produced a new set of problems. In the Turkish part of the peninsula, moreover, oppression finally drove the inhabitants of Northern Albania into revolt in 1910, and in the next year the war with Italy greatly weakened the Turkish military power.

The Attempted Solution. This combination of circumstances led the Balkan countries to form a league against Turkey. Sinking their own differences for a time, they declared war against the latter. Reorganization at home and the victory of Italian arms in Tripoli left the Turkish government vulnerable to a combined attack, and paved the way for the expulsion of the Turk from Europe.

The War. In October, 1912, military op-

erations were begun. According to the plan of campaign, the Montenegrins were to capture Scutari; the Serbians were to drive the Turks from Macedonia; the Bulgarians were to overcome the Turks in Thrace and then move on toward Constantinople; the Greeks were to capture Saloniki. The four armies moved forward at practically the same time. The Turks, unable to mass their forces to resist any one attack, were defeated by the Bulgarians in the great battles of Kirk-Kilisse and Lule Burgas, and within three weeks had lost several important fortresses. The main Turkish army took a strong position behind the works at Tchatalja, the only stronghold between the allied forces and Constantinople. On November 8 the Greeks captured Saloniki.

Proposals for Peace. The speedy victories of the allies forced the Turks to ask for a stay of hostilities; an armistice was declared December 3, and a peace conference was called to meet at once in London. The allies demanded that Turkey abandon its territory in Europe, except a small region around Constantinople, and pay a war indemnity. These conditions the Turks regarded as too humiliating, and the delegates could reach no agreement.

The War Resumed. The Balkan delegates withdrew from the conference, and hostilities were renewed in February, 1913, continuing until May 3. During this second campaign, Janina was captured by the Greeks, the Bulgarians took Adrianople, and Scutari fell before the Montenegrins.

Second Peace Conference. A second peace conference met in London on May 20, and on May 30 arranged a treaty of peace. By this treaty, Turkey lost nearly all of its territory in Europe; Albania was made an independent principality; Serbia obtained large additions of territory in Macedonia; Bulgaria secured an extension of territory to the Aegean Sea and obtained Adrianople; Greece gained Crete and extended its boundaries to include the province of Saloniki.

The Second War. Evidences of jealousy among the allies first appeared a month after the opening of hostilities in the first struggle, when the Bulgarians and Serbians insisted on sending some of their troops to Saloniki, which had already been occupied by the Greeks. A more serious problem concerned Albania. In March, 1912, Bulgaria and Serbia made a secret treaty providing for a division of the territory they planned to conquer from Turkey. By this agreement, Serbia was to receive the greater part of Albania, and thus win a port on the Adriatic Sea. Serbia was deprived of this territory by the erection of Albania into an independent principality. Bulgaria, on the other hand, by the treaty of peace, received not merely the territory agreed upon by the secret treaty with Serbia, but also Adrianople

and a considerable area in addition. Serbia at once claimed that the treaty of peace established new conditions, as a result of which "Bulgaria should not expect the preliminary engagements to be carried out." To this claim Bulgaria replied that a treaty was a treaty, and that the gain of Eastern Thrace in no way invalidated the old agreement.

In April, 1913, Serbia announced that it would not be bound by the treaty of alliance of March, 1912, and for two months following there was an unofficial state of war. The Greeks, too, set up extravagant claims against the equally extravagant claims of Bulgaria with reference to Saloniki and the Aegean coast. In June, when it was already apparent that Bulgaria, rather than yield to the claims of Greece and Serbia, was preparing for war, Rumania notified Bulgaria that it would not remain neutral in a second war except for a territorial consideration. Bulgaria's hesitation made Rumania an ally of Serbia and Greece; Montenegro, as Serbia's particular ally, was also involved.

Hostilities were begun by the Bulgarians on June 30, 1913, and by the end of July the war was over. Against Serbia, Greece, and Montenegro, Bulgaria had an even chance, but the addition of Rumania, which declared war on July 10, made the odds hopeless, and on July 21, when the allies were within twenty miles of Sofia, Bulgaria asked for an armistice. By the Treaty of Bucharest, signed on August 10, Bulgaria lost a considerable part of the territory taken from Turkey. The latter, in the meantime, seized the opportunity to retake Adrianople, which had been given to Bulgaria by the Treaty of London, and Bulgaria was obliged to cede the fortress and a large area beyond it to Turkey.

The peace settlement left Europe with new problems and a general condition of uneasiness in regard to the Balkan states. Serbia's enhanced prestige encouraged the Slavs of Austria-Hungary to exert renewed effort in behalf of independence. The Western powers increased their budgets for military expenditures, and conditions reached a climax in 1914, when most of Europe became involved in the World War.

B.M.W.

Related Subjects. The reader is referred to sections devoted to history in the articles ALBANIA, BULGARIA, GREECE, MONTENEGRO, RUMANIA, SERBIA, and TURKEY, and to the following additional titles:

Austria-Hungary	World War
Berlin, Congress of	Young Turks
Scutari	Yugoslavia

BALKASH, *bahl kahsh'*, a large inland body of salt water, lying 780 feet above sea level, in Southwestern Siberia. Its area is 8,500 square miles, nearly three times as great as that of Great Salt Lake in Utah, and its length is 330 miles. The width varies from six miles, in the eastern portion, to fifty-four miles in the west.

The water is intensely salt, but clear. The Balkash Sea is a mass of frozen ice from November until April.

BALL, THOMAS (1819-1911), an American sculptor whose influence in his special field of work has been permanent and uplifting. He first took up the study of portrait painting, then began his work as a sculptor by modeling a small bust of Jenny Lind, who was at the time appearing in song recitals in America. Then he attempted busts of other personages, and finally achieved success when he completed a life-size bust of Daniel Webster. In 1854 he was able to go to Florence, Italy, for further study, and remained there two years. Much of his later life was also spent in that city. He died in Montclair, N. J.

Ball devoted four years (1860-1864) to modeling an equestrian statue of Washington, and when it was unveiled in New York, it was declared to be the best of its type produced up to that time. A few years later, he completed a statue of Edwin Forrest in the rôle of Coriolanus, now a prized possession of the Actors' Home in Philadelphia. In 1875, a bronze representation of Lincoln freeing a kneeling slave

the *Emancipation Group*—was unveiled in Washington, and the following year saw the completion of the colossal bronze, *Daniel Webster*, in Central Park, New York. His statue of Josiah Quincy occupies a prominent place before the city hall, Boston, and in the Forest Hills Cemetery of that city is the well-known head, *Saint John the Evangelist*, sculptured by him.

Ball was seventy years of age when he began the masterpiece of his later period, the *Washington* monument at Methuen, Mass.

BALLAD, a story poem which is written not in the flowing meter and carefully chosen words which distinguish most poetry, but in a crude, almost rough, style, and in the simplest and most natural of words. These differences are explained by the manner in which ballads developed; for most of the true ballads had no one author. In such a poem, for instance, as Bryant's *To a Waterfowl*, it is easy to understand how the poet, having seen the solitary bird and been impressed by it, went to his home and wrote down his thoughts and feelings in poetic form. He chose the very best words he could summon, studying long over some of them, and made the lines as musical as a song. But no ballad had such a history.

When an event occurred, as a great battle, the marriage of a hero, the death of a beautiful girl, the people of some little village would gather to talk of it, and to celebrate or to mourn. Over and over, the event would be described, until gradually the more gifted persons would make a sort of song of the tale, one person contributing a line, perhaps, and then another. Thus grew up the earliest ballads,

strictly in the language of the people. There was no printing in these early ballad days, but parents handed down the verses to their children from generation to generation. Occasionally, stanzas would be dropped or others would be added, and once in a while a man of unusual poetic ability would work over the ballad and make it more perfect.

So there grew up among every European people a ballad literature, each country with few exceptions possessing its own "folk songs," as they are sometimes called. As learning spread and printed books became common, the literary class often knew nothing whatever of these old verse tales which the people treasured in their hearts; but occasionally there arose a man who had an intense interest in old literary forms, and who anxiously sought out the ballads, taking them down from the lips of old peasants who could not remember the time when they did not know them. In England and Scotland, in the seventeenth and early eighteenth centuries, these were often printed on single sheets of paper—"broad-sides," they were called—and sold in the street.

Finally, an Englishman, Thomas Percy, began to make a real study of ballad literature, and in 1765 he published *Reliques of Ancient English Poetry*. This served to interest others, and in the continental countries, especially in France and Germany, a similar revival took place. In England, Scott was among those who took up the study, publishing in 1802-1803 his *Border Minstrelsy*. These old ballads had a real influence on the writing of other forms of poetry, which had shown a tendency to become stilted and artificial, but now took on a greater freedom.

Among the most famous of the old English and Scottish ballads are the series known as the *Geste* (or *Deeds*) of *Robin Hood*, *Sir Patrick Spens*, *The Two Corbies*, *Fair Helen of Kirkconnel Lea*, and *The Ballad of Chevy Chase*. Many of the best-known English poems show the influence of the ballad, being imitations in form or in subject, as witness the following: Coleridge's *Rime of the Ancient Mariner*, Tennyson's *Revenge*, Rossetti's *Sister Helen*, Macaulay's *Horatius at the Bridge*, Campbell's *Lord Ullin's Daughter*, Cowper's *John Gilpin's Ride*, and Longfellow's *Wreck of the Hesperus*. An idea of the form and manner of the old ballad, with all its crudeness, may be seen from the following stanzas from *Chevy Chase*, a ballad of the days of James I:

At last these two stout earls did meet;
Like captains of great might,
Like lions wode, they laid on lode,
And made a cruel fight.

They fought until they both did sweat,
With swords of tempered steel,
Until the blood, like drops of rain,
They trickling down did feel.

BALLARAT, *bal a rat'*. See VICTORIA (The Cities).

BALLARD, HARLAN H., founder of the Agassiz Association (which see).

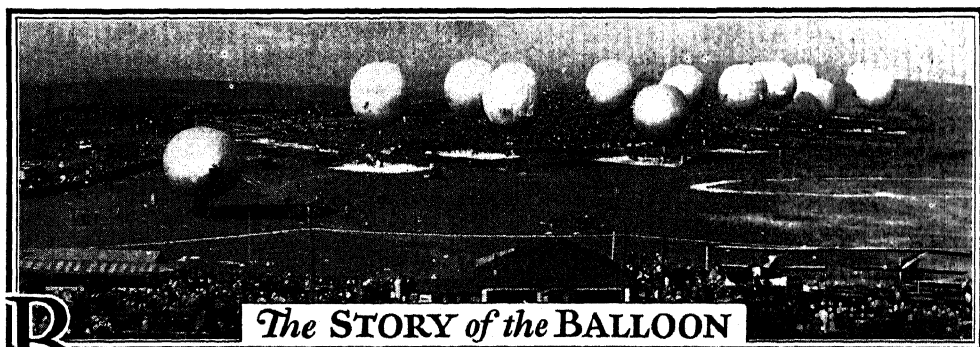
BALLET, *bal la'*, an artistic dance, developed and perfected in France, now used chiefly between the main parts in a light theatrical performance and in grand opera. Its original aim was to represent actions and feelings through dancing and gestures. This idea arose early in the eighteenth century, but the modern ballet is a spectacular dance rather than a dramatic representation. The ballet as used in modern operas is more nearly the ballet of old, for it is usually more or less closely connected with the play and incorporated in it, as in *Faust* and *Tannhäuser*. The costumes used

in the ballet of to-day are frequently expensive; to secure the effects desired, the most delicate fabrics and daintiest shades are employed, and the utmost art and skill are required of the designers.

The modern ballet is almost always danced by girls who are chosen because of their beauty. Both gowns and dances are designed to exhibit the dancers' charms, with the result that the entertainment may be one of grace and beauty or one of crudity and vulgarity, as is sometimes the case in large cities.

BALLINGER-PINCHOT CONTROVERSY. See TAFT, WILLIAM HOWARD (Administration); ALASKA (Development of Coal Lands).

BALLISTITE, *bal' is tite*. See AMMUNITION (Explosives); SMOKELESS POWDER.



The STORY of the BALLOON

BALLOON, *bal loon'*. From the earliest times man has known how to navigate the seas, but to navigate the air was a far more difficult problem, not solved for many centuries. Birds did it, even large and heavy birds; it was, therefore, evident that the air could be made to support weight that was properly distributed and properly buoyed up, but the method was not apparent. That the ancients speculated on the subject may be seen from the legend of Daedalus and his son Icarus, and their attempted flight across the sea (see DAEDALUS), but nothing practical was accomplished until toward the end of the eighteenth century, when the balloon was invented.

A balloon is distinguished from a heavier-than-air machine, or flying machine, the other modern air-navigating device, by the fact that the former uses gas or hot air to make it buoyant, while the latter depends on complicated machinery.

Historical. It is almost impossible, in a day when aircraft has become commonplace, to realize the intense excitement that prevailed over the first successful balloon. It was an Englishman named Cavendish who first announced the principle that a bag of some light material filled with a gas lighter than air, preferably hydrogen, was certain to rise. However, he made no attempt to prove his theory

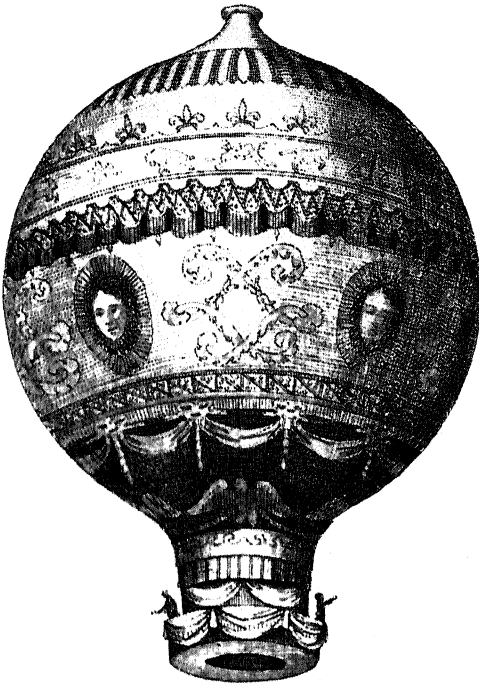
by an experiment, and two Frenchmen, the Montgolfier brothers, determined to test his principles.

[The story of the efforts and successes of the Montgolfier brothers is told in these volumes in the article AIRCRAFT.]

Improvements. The hot-air balloon had its disadvantages. When the air cooled, the balloon was bound to fall, and its time in the air could not be regulated; but a scientist of Paris, Professor Charles, in August, 1783, constructed a balloon which had practically all the features of a balloon of to-day. It was made of varnished silk, and was filled with hydrogen, which it had taken Professor Charles four days to produce by the slow methods then employed. Scores of thousands of people gathered to watch it as it rose over Paris, and for almost an hour it remained in view, about 3,000 feet above the earth; but then it began to drift, and later came to earth fifteen miles away in a field, where it was torn to pieces by the terrified peasants, who believed it to be an evil spirit.

The next step was the sending up, in a car below the gas bag, of live passengers—a fowl, a duck, and a sheep; and in November, 1783, two men ascended in a hot-air balloon to a height of 500 feet, and traveled for five miles before descending. In the development of bal-

looning, many competent men were found who were willing to risk their lives in perilous as-



MONTGOLFIER BALLOON

It operated on the same principle as the present-day paper balloons, so popular on festive occasions.

censions; in 1785, two men crossed the English Channel from Dover to Calais.

Modern Balloons. Improvements continued to be made in details, though not in principle, until the balloon of to-day was evolved. This consists of a bag of soft cloth, silk, woolen, or cotton, coated with rubber varnish and covered with a network of cords, to which the wicker car for passengers is attached. In the top is a valve for the escape of gas, operated by a cord which reaches into the car, and the bottom of the bag is left open. The gas most used is coal gas, which is far cheaper than hydrogen but not so entirely satisfactory, because of its greater heaviness. A balloon which is to carry any considerable weight must be large, and a diameter of over 120 feet has been achieved.

Besides the human freight in the dangling car, the aeronaut has his instruments for the reading of atmospheric conditions, and a quantity of ballast in the form of sandbags, which may be thrown out to lighten the load when he wishes to rise to a greater height. By means of these and the valve, he can control his ascent and descent, but that is all the guidance he can give; as to horizontal directions, the balloon must move "at the wind's will." Dirigible balloons, or "guidable" balloons, have

been invented and have proved most useful, but on account of the machinery necessary for their control they are classed rather as airships.

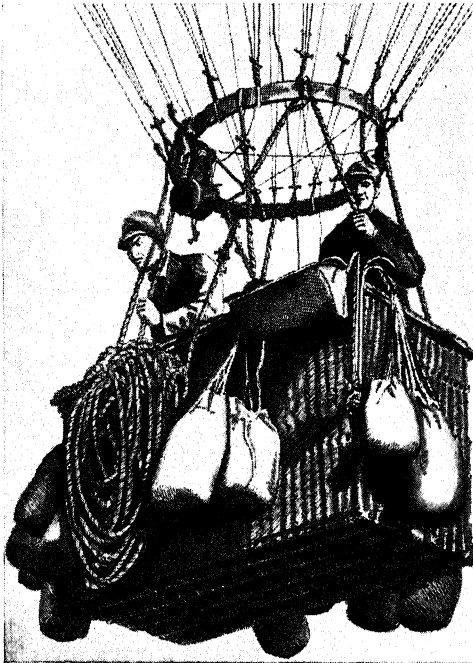
Uses of Balloons. The uses of these balloons, which cannot be directed, are of course limited, but they have been of value in securing scientific information as to air conditions. Since men cannot breathe in highly rarefied atmosphere, unlimited upward flights are impossible for manned balloons, but little ones made of rubber have been sent up frequently to great heights, and the recording apparatus attached to them gives valuable information. The balloons themselves do not return to the earth, for the inner pressure explodes them in the thin upper atmosphere, but a parachute brings the instruments down in safety. One of these sounding balloons, as they are called, which was sent up from Pavia, Italy, reached a height of 123,505 feet (nearly twenty-five miles) and brought back the information that at that great height the temperature was -60° , and the pressure of the air only $1/250$ of what it is at the earth's surface.

In warfare, balloons have been used in various ways. The besieged people of Paris, during the Franco-German War, in 1870-1871, conducted most of their communication with the outside world by means of them, and thereafter every large country added to its military service a balloon corps. It is not the freely moving balloon which is of use in military operations, but the *captive*, or anchored, balloon. It is attached to a cable, by means of which its movements are controlled, and it floats above the field just high enough to make clear observation possible. The great usefulness of balloons in such operations was further demonstrated in the World War; each nation used them as stationary observation stations, leaving them in the air but a few moments at a time, then hauling them down. For most uses of observation and scouting, however, speedy airplanes proved far more effective.

Balloon Records. For half a century the altitude record for balloon ascents was that of Coxwell and Glaisher, who, in 1862, reached a height of almost six miles. In the rarefied upper air, one of the aeronauts became unconscious, and the other nearly so; thirteen years later two men died in mid-air during ascensions in France. When two German aeronauts made an ascent in 1901 to a height of 35,600 feet (nearly seven miles), they carried with them oxygen for inhaling, and so reached earth in safety. (For the highest record made, see page 115.) In 1895 Salomon August Andr  e, a Swedish scientist, attempted to reach the North Pole in a balloon. Had he been successful, he would have established a world's record not only in ballooning but in polar exploration and discovery. However, his fate is unknown, for no

word ever came from the expedition (see ANDRÉE, S. A.).

In long-distance balloon traveling, the record was established in 1912 when a French contestant for the James Gordon Bennett cup sailed from Stuttgart, Germany, to the neighborhood of Moscow, a distance of 1,361½ miles.



BASKET OF BALLOON

The weights on the sides are sandbags, referred to in the text.

Every year competitions for this cup are held, the race starting in the country which won the cup the year before. Air navigation by means of balloons has thus become a sport rather than a serious pursuit. See AIRCRAFT.

BALLOT, a device employed by which a voter is enabled to express secretly his choice in elections.

The form of ballot most widely used in modern political elections is a printed ticket. Such ballots were in use in nearly all of the original thirteen American states when the Constitution was ratified, though most early ballots were written, and they were adopted gradually by the states that later came into the Union. Certain grave defects were characteristic of early methods of voting. It became the general custom for the political committees of the various parties to prepare and distribute the ballots, and the tickets were arranged in such a way that it was very difficult for a voter to express individual preferences for candidates outside his own party. Moreover, the voter received his ballot within a few feet of the

polls, and coercion and bribery were common. To correct these evils, the Australian ballot system was adopted, beginning in Massachusetts in 1888. (For details, see AUSTRALIAN BALLOT.)

The adoption of the Australian ballot, however, did not end efforts at ballot reform. The large number of officials chosen at one time in American elections, particularly in the large cities, has necessitated the printing of huge tickets sometimes two or three feet long, and these are often so complicated that even an experienced and educated voter is quite unable to give an intelligent expression of his preferences. There has been for years a widespread movement for the simplifying of the election ballot; the various measures proposed are discussed in the article SHORT BALLOT.

Ancient Customs. In ancient Athens, the judges of the highest court generally gave their verdicts by dropping stone or metal balls into boxes selected for that purpose. Those pierced in the center, or colored black, stood for verdicts of condemnation, while the unpierced, or white, balls, meant acquittal. Shells with marks (*ostrakon*) were also employed, and their use in popular elections gave rise to the institution of *ostracism* (which see), by which citizens who were considered dangerous to the welfare of the state were driven into exile. The Romans generally used wooden tickets (*tabellae*); when a change in law was proposed, those in favor marked the ballot with the letters *U R* (for *Uti rogas*, meaning *as you ask*); a vote against the change was indicated by the letter *A* (for *Antiquo*, meaning *for the old*). In an election of candidates for public office, the names of the candidates were written on the ballots. These customs of secret voting continued into the Middle Ages.

[See illustration, in article ARISTIDES.]

Derivation. The word is derived from the French *ballotte*, meaning *a little ball*; *voting by ballot* takes its name from the ancient custom of using colored balls in secret voting. Even to-day applicants for membership in clubs, lodges, etc., are voted on by means of balls, generally white and black, and a person rejected is said to be *blackballed*. E.D.F.

BALM, *bahm*, a tall, fragrant plant of the mint family, growing wild in the damp and shady woodlands of the southeastern part of the United States, Southern Europe, and Western Asia. It is cultivated in gardens as a seasoning herb, and to some extent as bee forage. The leaves have a lemonlike fragrance, and are used in cookery to give an agreeable flavor to soups, dressings, etc. Balm tea, a fever-reducing beverage, and balm wine are also made from the leaves. Oil of balm is employed by some manufacturers of perfumes. Since the dried leaves retain their fragrance, they can be kept for winter use. In different localities, the plant is known as *horsemint*,

bee balm, and *Oswego tea*, and it is often confused with a common variety of catnip, which has a similar odor. G.M.S.

Scientific Name. Balm belongs to the family *Menthaceae* (or *Labiatae*). Its botanical name is *Melissa officinalis*.

BALM OF GILEAD, a resinous substance which the ancients highly valued for its fragrance and its supposed medicinal properties. It is the product of a tree found in Arabia and Abyssinia, and is commonly regarded as the balm mentioned frequently in the Bible. The name *balm of Gilead* is also applied to a variety of the balsam poplar, found in Eastern North America. See **POPLAR**. B.M.D.

BALOK, *bal'uk*, a king of Moab. See **BALAAM**.

BALSA, *bawol'sah*, the lightest wood in the world, one-third lighter than cork. So recently has it come to public notice that until 1921 it had never been described in print. Balsa is a rapidly growing tree, also quick to decay; it is found only in hot countries, and weighs only seven pounds to the cubic foot (some woods weigh as much as eighty pounds). This lightness results from its peculiar cellular structure, which differs from that of any other wood. The cell walls are extremely thin, and where in other woods there are closely packed fibers, there is in the barrel-shaped cells of balsa a quantity of dead air, which represents nine-tenths of the total volume of the wood.

Uses of Balsa. The wood is excellent for life preservers, and when waterproofed, for life rafts, which all passenger vessels must carry. It is a good insulating material for refrigerator rooms and cold-storage warehouses. There is a fibrous material in the fruit, which is valuable for pillows, cushions, and mattresses. During the World War, it was employed as floats for thousands of mines in the North Sea. G.M.S.

Scientific Facts. Balsa is closely related botanically to the mallows, hollyhocks, and cotton. It is known to botanists under the generic name of *Ochroma*, of which there are several species. It is ranked in the order *Malvales*, which includes the three plants mentioned above.

BALSAM, the name given somewhat generally to a resinous, spicy substance that is secreted by certain plants. In North America, the valuable *Canada balsam* (which see), a secretion of the balsam fir, is most familiar, but technically the balsams of Peru and Tolu (Colombia) have the best right to the name. These are obtained from American trees of the pulse family. Balsam of Peru is a sticky, dark-brown liquid that retains its fluidity on exposure to air. As an ointment, or an alcoholic solution, or mixed with castor oil, balsam of Peru is sometimes applied to ulcera-

tions that are slow in healing, and it is also used as a remedy for skin diseases. It is not taken internally. Balsam of Tolu is a yellowish-brown or brown solid; it is plastic when fresh, but brittle when old. It is used as an ingredient of chewing gum and of expectorants (preparations for expelling mucus from the throat or lungs).

BALSAM CONE. See **BLACK MOUNTAINS**.

BALSAM POPLAR. See **BALM OF GILEAD**.

BALTHASAR, *bal'tha'zar*. See **MAGI**.

BALTIC LEOPARD, the trade name of a fur. See **RABBIT**.

BALTIC SEA, an inland sea, or large gulf, of Northern Europe, of great commercial

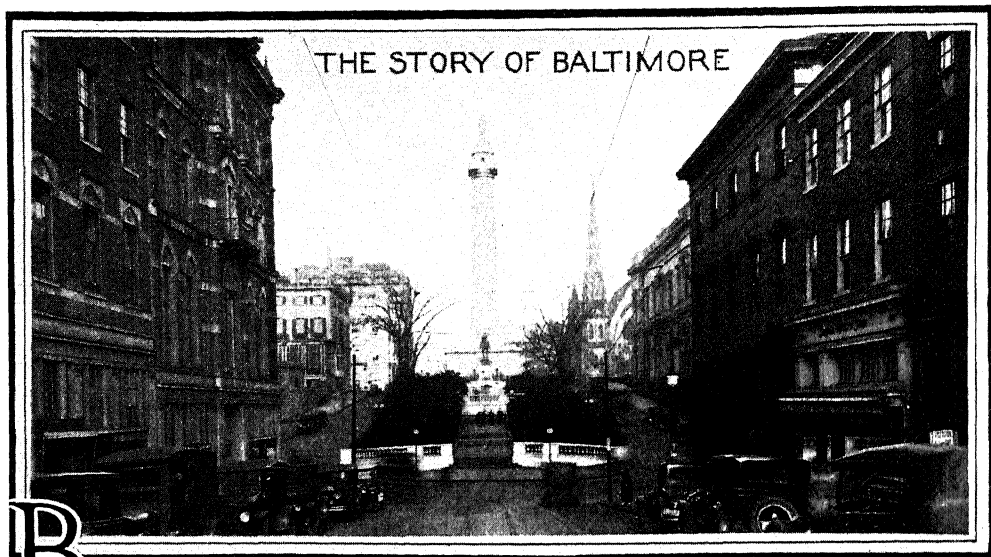


LOCATION OF BALTIC SEA

importance. It affords Russia its principal maritime outlet, through the North Sea and the Atlantic Ocean, and forms part of the coast line of Denmark, Germany, Sweden, Russia, Finland, Estonia, Latvia, Lithuania and Poland. It covers about 160,000 square miles, a little more than the area of the state of California. Its greatest length is about 950 miles—farther than the distance from New York to Chicago; the greatest width is 400 miles. Including gulfs and bays, its coast line measures nearly 5,000 miles.

The important harbors are at the cities of Copenhagen, Kiel, Danzig, Memel, Riga, and Stockholm. The Baltic is a stormy sea, particularly in winter.

More than 250 rivers flow into the Baltic; this fact, in connection with its small outlet, makes its water much less salt than that of the ocean. The narrow straits of the Great Belt, Little Belt, the Sound, the Skagerrack, and Cattegat give access to the ocean, and the Kiel Canal connects the Baltic and the North Sea. A chain of islands guards the entrance to the Gulf of Riga and the Aland Archipelago forms a barrier across the mouth of the Gulf of Bothnia. The trade of the Baltic is interrupted by ice during winter.



BALTIMORE. Situated at the head of tidewater navigation, on an arm of Chesapeake Bay, lying farther west than any other major Atlantic port, this largest city of Maryland has developed as a great commercial and industrial center without losing any of the charm and individuality that have enveloped it from colonial days. The leisurely spirit of the Old South has been combined with modern ideas of progress and city improvement, and to-day Baltimore is at once a thriving manufacturing and port city, a home community, and a center of culture and education.

The People. Unlike most port cities, Baltimore has a very small foreign element; the number of American-born people comprises over eighty-eight per cent of the total population, which increased from 558,485 in 1910 to 733,826 in 1920. In 1928 the Census Bureau estimated the population to be 830,400. Negroes comprise about one-sixth of this number. Among American cities, Baltimore ranks eighth in population.

Because of the Maryland ground-rent system and the successful operation of over 800 building and loan associations, houses in Baltimore may be purchased on very reasonable terms; hence, over sixty per cent of the city's dwellings are occupied by their owners. This fact, coupled with a low cost of food and absence of labor trouble, has made the city especially attractive to working people, and has greatly contributed to its rapid growth in population. Baltimore has also profited by an enabling act passed in 1918 by the state legislature, whereby it was permitted to annex about sixty square miles of suburban territory, some of it densely populated. The city area was then increased to 91.93 square miles.

Location. Baltimore is situated on the Patapsco River, fourteen miles from Chesapeake Bay, and about 200 miles from the open ocean. It is 187 miles southwest of New York, and ninety-five miles southwest of Philadelphia, but is considerably farther west of both cities than it is south of them. Geographically, it has unique advantages, for it is nearer to the country's center of population, to the markets and raw materials of the Middle West and the South, and to the Panama Canal than New York, Philadelphia, or the New England ports, and is closer than San Francisco to the west-coast ports of South America. The difference in freight rates resulting from such proximity is clearly to the advantage of Baltimore.

General Description. The visitor to this city, one of the oldest in America, is usually impressed by the general aspect of newness in the business section. This appearance is due in part to the reconstruction of the district after a disastrous fire occurring in 1904, but also to the fact that Baltimore inaugurated a city-improvement program within the next two decades that completely modernized it, and entailed the expenditure of many millions of dollars. Among the major projects may be mentioned the building of a great sewerage system, one of the finest in the world; and the repaving of the streets, whereby the old cobblestone thoroughfares were transformed into smooth avenues. Over 600 miles of new paving were laid down. Crossing the city diagonally, from the railway terminal to the docks, is the Fallsview, a highway built over Jones Falls, which was formerly a small, open stream polluted by sewage. Concrete tubes were built upon the bed of the stream, making it a part of the modernized sewerage system.

The business section centers about the intersection of Baltimore and Charles streets. In this vicinity are the city and Federal government buildings, including a beautiful white marble courthouse in classic design. A few blocks north is a civic center of which all Baltimoreans are proud—the intersection of Washington Place with Mount Vernon Place. In the center of the cross-shaped area, Washington Monument rises to a height of 164 feet. Begun in 1815, it is the oldest monument in America commemorating the first President. Several other statues surround it, and near by are the Peabody Institute and Walters Art Gallery. Battle Monument, erected in memory of the fallen defenders of the city in the War of 1812, is held in scarcely less honor. This shaft, fifty-two feet high, is a conspicuous structure on Monument Square, near the post-office and courthouse. It is to these two monuments, rather than to the scores of others in parks and squares, that Baltimore owes its popular name of "Monumental City."

Of the sixty-seven parks and squares distributed over the city, Druid Hill Park, with an area of 657 acres, is the largest and most beautiful. Its notable features include Druid Lake, an artificial reservoir that is part of the city waterworks system; miles of bridle paths, with shelters for riding horses; an extensive zoölogical garden; and several fine statues, including one of Christopher Columbus, erected in 1792. The city park system, covering over 2,500 acres, is ably managed and is not a burden to taxpayers, for nine per cent of the gross receipts of the street railway is set apart for its maintenance. Special provision is made for sports and recreation for persons of all ages. Opposite Venable Park, a concrete stadium with a seating capacity of 78,000 has been erected. The Park Board has also established tourists' camps, with every kind of convenience, in several of the parks. The city boulevard system provides easy connections between the different parks and with the state highway system. The proximity of the Blue Ridge Mountains, Annapolis Naval Academy, Gettysburg battlefield, and other places of scenic or historic interest makes Baltimore a popular center for motorists.

Institutions. Johns Hopkins University (which see), one of the world's great educational institutions, was opened in 1876. Peabody Institute, with its vast library, art gallery, and conservatory of music; Goucher College (Methodist Episcopal), Maryland Institute for the Promotion of Mechanic Arts, Saint Mary's Seminary of Saint Sulpice, Loyola College, Saint Joseph's Seminary (colored), Morgan College (colored), McDonogh School, Bryn Mawr School, Visitation, Notre Dame of Maryland, and Mount De Sales academies are institutions of high rank. Professional schools

include the law and medical departments of the University of Maryland; Baltimore Medical College; Baltimore College of Dental Surgery, the oldest of its kind in the United States (1839); Maryland College of Pharmacy, and the College of Physicians and Surgeons. In addition to the public libraries, the joint gift of Enoch Pratt, the city, and Andrew Carnegie, there are numerous special collections and the libraries of the various colleges. The public music interests of the city are cared for by a municipal Department of Music, which has supervision of the symphony orchestra, municipal band, and other musical organizations.

Historic and Literary Associations. Fort McHenry, now a national monument, commands the harbor, and is a perpetual memorial to Francis Scott Key and his *Star-Spangled Banner* (see, also, section on *History*, below). Two of America's finest lyric poets made their homes in Baltimore—Edgar Allan Poe and Sidney Lanier; a third, Lizette Woodworth Reese, is still living there. Poe's grave, in Westminster Churchyard, is an American literary shrine.

Commerce. Baltimore is both a great railroad and a great steamship center. It is served by three trunk lines—the Baltimore & Ohio, the Pennsylvania, and the Western Maryland. Ten other roads make connections with the city, and there are several lines that serve the local industries. The railway freight differentials which the city enjoys by virtue of its westerly position, and the elimination of wharf charges on such freight, have contributed greatly to its industrial development.

In an earlier period, the swift "Baltimore clippers," speediest boats of their time—

. . . "brought the cargoes of their day
From the ports of seven oceans, homing
white-winged up the bay."

A sentimental interest attaches to these picturesque craft, which no longer are seen in Baltimore's modernized harbor. The port, an arm of Chesapeake Bay formed by the widening of the Patapsco, has been developed and improved on an ambitious scale, and is now a landlocked harbor, capable of accommodating 200 vessels at one time. It has the advantage of a low tide range, as the difference between high and low tide is but fourteen and a half inches. Of 127 miles of water front, forty-five miles have been improved, and the city has available (through legislative action) adequate funds for future construction; the principal channel is thirty-five feet deep and 600 feet wide. Baltimore is the second or third Atlantic port in amount of foreign commerce, and a terminal for over fifty regular steamship lines. Its yearly tonnage through the Panama Canal exceeds that of New York

by 200,000. It is the leading corn-exporting city of the Union, and has the greatest elevator capacity for grain export; it also has the largest coal-loading pier in the world.

Industry. Almost every commodity in general use is manufactured in the city. In the United States, Baltimore is first in the manufacture of pajamas, underwear, and middy blouses, sulphuric acid, fertilizer, straw hats, and cotton duck. It is third in clothing manufacture, and is one of the leading American cities in the production of copper, tin, and sheet-iron products. It has the largest copper-refining plant in the world, and its tin-decorating, bottle-stopper, and spice factories are famous. Other important industries include slaughtering and meat-packing, and the canning of fruits and vegetables. Half the tomato pack of Maryland is credited to Baltimore. The total annual value of manufactured goods is about \$650,000,000. The factories employ 140,000 workers.

A unique feature of the city's industrial life is the operation of eleven municipal markets, for the sale of food to residents in widely scattered sections. Chesapeake Bay, with its fish, oysters, and crabs, and the Maryland truck farms, conveniently near, help Baltimore to maintain its reputation of having the best and cheapest food of any Eastern city.

History. The city was named in honor of Cecilius Calvert, second Lord Baltimore, who founded the colony of Maryland. The town was settled in 1730. In 1732 Jones' Town, on the opposite side of the stream, was settled, and in 1745 the two were consolidated. Originally, the city was included in Baltimore County, of which it became the county seat in 1767; later, city and county were separated, and at the present time Baltimore has a government independent of the county. During the Revolutionary War, the city for two months was the seat of government, when the Continental Congress was forced by the British to retire from Philadelphia. Since 1780 it has been a port of entry, and since 1796, an incorporated city. In September, 1814, it repulsed two attacks by the British, in the battle of North Point and in the bombardment of Fort McHenry, which occasioned the writing of *The Star-Spangled Banner* (which see). In Baltimore, April 19, 1861, the first blood of the War of Secession was shed, when Union troops, passing through the city in response to Lincoln's call for volunteers, were attacked by citizens; the city remained under martial law until the close of the war.

On Sunday, February 7, 1904, the city was visited by a great fire, which continued for two days. Almost the entire business district was destroyed, the loss being estimated at \$125,000,000. Because of the spirit of enterprise awakened by the disaster, Baltimore

citizens now look upon the fire as a benefit. This was the first city in the country to illuminate its streets by gas (1821); the first steam passenger train in the United States was operated on the Baltimore & Ohio Railway from this point to Ellicott Mills (fifteen miles). This road erected, in 1829, the first railroad station built in America. It is now in use as a freight station. Baltimore received, on May 24, 1844, the first telegraph message sent over wire anywhere in the world (see MORSE, SAMUEL F. B.). In this city, too, were built the first linotype machine and the first iron vessel run by steam. See MARYLAND. C.E.D.

BALTIMORE, SIR GEORGE CALVERT, known best as Lord Baltimore (1580-1632), was an English statesman to whom King Charles I granted the right to found the colony of Maryland. He became Secretary of State to James I in 1619, but six years later, having declared himself a Roman Catholic, resigned his position and thereafter gave all of his attention to the work of colonizing in the New World. It was Lord Baltimore's desire to establish a colony where his Roman Catholic countrymen would be free from persecution. He had founded a small settlement in Newfoundland in 1621, but the unfavorable climate led him to give up the enterprise. Charles I, who came to the throne in 1625, was friendly to him, and in 1631 granted to him a tract of land in Virginia, north and east of the Potomac. Before the charter was signed, Lord Baltimore died, and the charter rights passed to his son, Cecilius Calvert, the second Lord Baltimore, who founded the colony that was named Maryland, in honor of Henrietta Maria, queen of Charles I. The successes and discouragements that beset the new colony are told in the article MARYLAND.

BALTIMORE ORIOLE, which is also called HANGBIRD, FIREBIRD, or GOLDEN ROBIN, is a song bird of North America, known for its splendid plumage and musical whistle, and above all, for its remarkable skill in nest building. The nest, formed like a long, slender purse, from six to eight inches deep, is woven onto the limb of a tree which has long, drooping branches, the elm and the weeping willow being favorites. It hangs at some distance from the ground, protected from sun and rain by the overspreading leaves. The materials used are principally grass, strips of bark, strings, hair, and vegetable fibers. The eggs, four to six in number, are less than an inch long, and are dull white, with irregular, dark-colored blotches.

The male bird is a handsome creature from seven to eight inches long, with glossy-black head and upper parts, white-tipped wings, and brilliant orange under parts. The female is a little smaller than her mate, and is paler in color, with the black sometimes replaced by olive-brown or grayish-orange.

These birds feed on small caterpillars, click beetles, ants, wasps, plant lice, and other injurious insects, and since they seldom disturb any of the garden fruits, they are harmless, as well as useful. The birds are found chiefly in the temperate regions of Eastern North America, but migrate in winter to Central and South America.

Linnaeus, who obtained his first specimen from Maryland, gave the name *Baltimore oriole* to the bird as a compliment to Lord Baltimore, proprietor of the colony, because his colors, like the bird's, were orange and black. See ORIOLE. D.L.

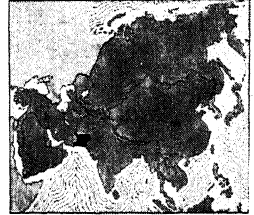
Scientific Name. Orioles belong to the black-bird family, *Icteridae*. The Baltimore oriole is *Icterus galbula*.

BALUCHIS, *baloo'-cheez*, the native race which gave its name to Baluchistan (which see).

BALUCHISTAN, *ba loo chis tahn'*, a province of British India, occupying an area of 134,638 square miles in the extreme western part of the Indian Empire, with Persia on the west. From its southern boundary, where it meets the Arabian Sea in a steep, inhospitable shore line, to the borders of Afghanistan on the north, it is rocky, dry, and desolate. Mountain chains, some of them attaining heights of from 10,000 to 12,000 feet, are found everywhere except in the northwest, where stretch wide plains of mingled stone and sand. Several short rivers start from the north toward the sea, but few of them reach it, for unless they sink into the sand and disappear, they are drawn off for irrigating purposes, for Baluchistan has very little rain. Some districts average only five inches a year, and even the most primitive agriculture cannot be carried on with this amount of rainfall. Where irrigation can be practiced, grains, cotton, indigo, and various fruits will grow, and the fruit of the date

palm, as in so many dry countries, is a staple product.

The People. The inhabitants, numbering about 800,000, are of two different races—the *Baluchis*, for whom the state is named, and the *Brahmis*. The former are Aryans, and are related to the peoples of India and Persia, but of the race connections of the latter nothing has been learned. Scarcely any of the people can be considered fully civilized, and the large proportion of the inhabitants, who roam the deserts with their goats, sheep, and camels, are very primitive in their methods of life. In religion, practically all are Mohammedans. See NOMAD LIFE.



LOCATION MAP

Government and History. The history of this barren and uninviting country, previous to the time that Europeans began to interest themselves in Southern Asia, is little known. A member of the Persian ruling house established himself firmly about the middle of the eighteenth century, and to-day the various tribal chiefs still acknowledge in a hazy way the supremacy of the khan, or king, of Khelat, although from Quetta, their capital, the British exercise authority over the entire territory, administered by a chief commissioner, or agent to the Governor-General. The area under immediate control of the British, however, covers but 54,228 square miles, and numbers about 421,000 inhabitants.

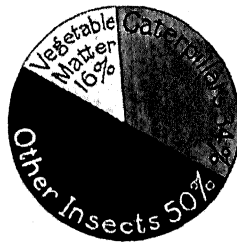
Barren and mountainous, the country has remained undeveloped for the most part, but since the World War railways have increased to 850 miles, and road communications between important centers have been established, thereby increasing the economic importance of the territory.

BALZAC, *bal zak'*, HONORÉ DE (1799-1850), the foremost of French novelists, of whom it has been declared that with Shakespeare he presents "the greatest storehouse of documents that we have on human nature." He wrote more than two-score books.

Balzac was born at Tours, on May 16, 1799, of a family which could lay no claim to rank or to intellectual distinction. He himself showed no sign of unusual ability in his somewhat neglected youth, and was much more fond of playing truant and of wandering about the country than of studying. Though educated for the law, he firmly refused to practice, and held true to his desire to live by his pen. His family could give him no financial aid, and the public paid little or no attention to his early novels; but he persisted, and in 1829, with the



THE NEST



FOOD OF THE
BALTIMORE ORIOLE

publication of *The Chouans*, it became evident that he was a writer of real genius. Not content with simply turning out one novel after another, planlessly, he formed for himself a vast design, so ambitious that a long lifetime would have been all insufficient for carrying it out. This was no less than the writing of a series of novels, under the general title of *The Human Comedy*, which should picture every phase of human life in the France of his day.

His plan was left incomplete at his death, but it had resulted in an astonishing number of novels, containing those marvelous character delineations which entitle him to rank next below Shakespeare in his power to describe men's characters. The person who reads any considerable number of his books is conscious of a longing for more "sweetness and light," for he does not hesitate to introduce the most sordid and even vicious of characters and happenings; but with all of this, he keeps his emphasis true, and makes the better and more ideal aspects of life the more attractive. The best of his novels, in addition to others mentioned here, are considered to be *Old Goriot*, a study of a father's self-sacrificing and unrepaid devotion to his daughters; *Cousin Betty*, which treats of the love of a niece and an aunt for the same man; *Cousin Pons*, which has as its theme the poor relation who has outstayed his welcome; and *Lost Illusions*, a long, complicated tale of Parisian life, with emphasis on its baser elements.

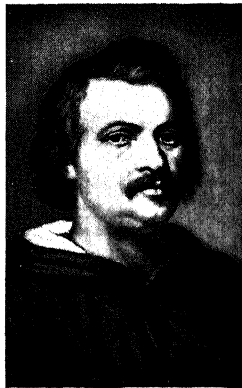


Photo: Brown Bros.
BALZAC

Eugénie Grandet is considered by some critics the greatest novel ever written. This is not because it has an absorbingly interesting plot, for the story is a simple one, with no exciting incidents; nor yet because its pen pictures are beautiful or unusual, for the setting is a dull, bleak old house in a village street; but the character-drawing is masterly. Nowhere else in literature is there such a study of avarice as old Monsieur Grandet presents, and the other characters grouped around him show equal skill in pen portraiture. Had Balzac written but this one novel, he would still stand in the first rank as an interpreter of human nature.

During the latter part of his life, Balzac was much under the influence of Madame Evelina Hanska, a Polish lady with whom he was in love, and this intense emotion interfered con-

siderably with his work. Only a few months before his death, he married her.

BAMAKO, *bam a' ko*, capital of French Sudan (which see).

BAMBOO, the popular name for giant, tree-like grasses of the tropics and adjacent regions, the uses of which are exceedingly numerous.



SOME USES OF BAMBOO

The building, the pier, and even the boat, in this Indian Archipelago scene, are made from the indispensable bamboo.

There are about two hundred species, varying in height from a few feet to 120 feet. The largest bamboo trees are sometimes three feet around. The stem, like that of other grasses, is jointed, and springs from a jointed, underground rootstock. The plant usually grows tall and erect, reaching its full height before the branches form quite a dense thicket near the top of the stem. The flowers hang in large clusters. Some species blossom every year, while others bloom only once in many years.

Bamboos are found in both the eastern and western hemispheres, but occur most abundantly in tropical Asia. They grow in both of the Americas, and to a limited extent in Africa. None is native to Europe. Some species are found on the high slopes of the Himalaya and Andes mountains. In the Southern United States, the dense growths of cane (a kind of bamboo), occurring in the swamps, are known as canebrakes.

Uses. The bamboo stem, hard, light, elastic, and hollow, is the most interesting and useful part of the plant, and it serves the people of Malay, India, Ceylon, China, Japan, and the Philippines in innumerable ways. The bamboo wood, split up is made into floors or rafters in dwelling houses; sections of the stem form posts or columns. Often the entire roof is made of bamboo wood. The Japanese have forests of these trees, which they cultivate for building purposes. Travelers in Japan tell of the most charming bamboo greenhouses, and of bamboo stems used as waterpipes in connection with bath houses. The outer layer of the stem the Japanese cut into thin strips, to be used in basket-making, and the bamboo fibers are employed in the manufacture of paper.

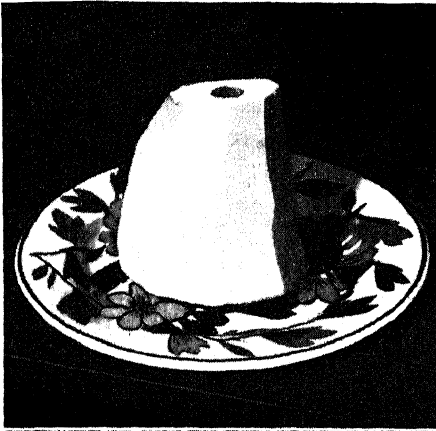


Photo: U & U

A Great Bamboo Plantation in China. It appears like a forest of fishing poles; the height of the man emphasizes the length of the treelike grasses. In the upper corner a canned bamboo shoot is shown as a food. The canned-bamboo industry is almost in its infancy.

The Chinese have bamboo beds, couches, chairs, tables, and stools; children in China play with bamboo toys; the workman uses tools with bamboo handles; the boatman has bamboo ribs for the sails of his ship. Bamboo



Photo: U. S. Dept. of Agriculture

AN AMERICAN BAMBOO GROVE

This is one of the plant-introduction gardens maintained by the Department of Agriculture. This grove is near Savannah, Ga., and is about forty years old. The plants are from fifty to sixty feet in height.

cooking utensils, life-preservers, bows, arrows, quivers, fishing rods, mats, canes, musical instruments, fans, parasols, pipes, and playing cards are other examples of the extreme usefulness of this interesting plant. See CHINA (Plants and Animals).

The grains of the bamboo are valued as food, and in China they take the place of rice when the crop of the latter fails. The young shoots of some species are pickled in vinegar, and are sometimes cooked like asparagus; they form one of the principal ingredients of American "chop suey." The bamboo also has ornamental qualities, and some of the hardier varieties are cultivated in England and the United States in landscape gardens and greenhouses. Near Savannah, Ga., the United States Department of Agriculture maintains a bamboo farm which, started about 1890 from a single shoot, since 1920 has distributed thousands of plants, throughout the South and Southwest. Various species of bamboo are being studied to determine which are best adapted to American soil and climate, and eventually the United States may supply its own bamboo for flower stakes, fishing rods, and bean poles. B.M.D.

Classification. The more than twenty genera of bamboos constitute the tribe *Bambuseae* in the grass family. The important genera include *Bambusa*, *Arundinaria*, and *Phyllostachys*.

BAN, a word with an interesting history and a variety of meanings, used at the present time in the sense of *to prohibit* or *condemn*. Thus, a person who has rude, coarse manners is said to be *banned* by society, or to be *under its ban*. In its earliest use, ban meant a *proclamation*,

and also the fine imposed for disobeying it. Later, in France, the word was applied to a summons to arms, and from this, to the vassals of the king who were called upon to perform military service. During the Middle Ages a person "under the ban" was one who had been outlawed, and this expression was also applied to the outlawing of entire cities. In the history of the Roman Catholic Church, those who suffered excommunication were said to be *under the Papal ban*. In the course of time ban came to be used in the sense of *curse*, and so occurs in *Hamlet*:

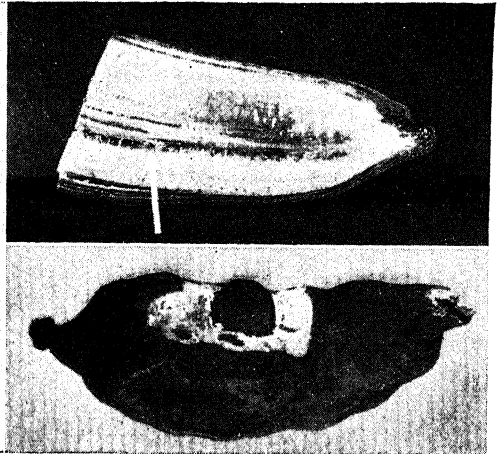
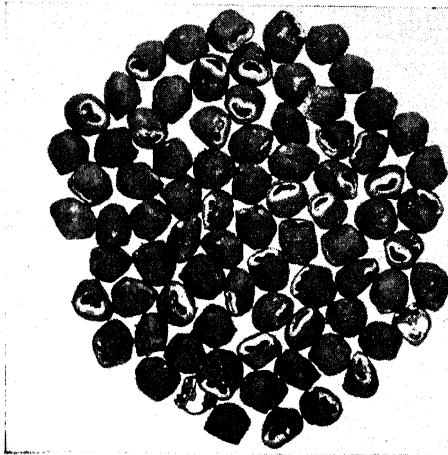
With Hecate's ban thrice blasted, thrice infected.

In Early Days. The earliest meaning of the word, that is, a *proclamation*, survives in the expression *banns of marriage* (which see).

BANANA, *ba nah' nah*, or *ba nan' ah*, a tropical fruit which is relished the world over. To say that the great, heavy bunches of bananas which are so familiar a sight in the markets do not grow on trees, but upon herbs, sounds at first absurd and impossible. It is, however, the truth; but in the tropics herbs grow to such great size that they would not be recognized as such by people in temperate regions.

How It Grows. The banana has an underground stem which sends up suckers or sprouts that attain their full growth in a year and a half or two years. Its "trunk" is not really a trunk at all, but a false stalk, formed by the curled bases of the leaves, which wrap themselves about the flower stem. This stalk, almost a foot in diameter at the bottom, rises to a height of from ten to forty feet, its great leaves, a foot or two in width and from six to ten feet in length, drooping outward. When the plant has reached its full growth, there appears a huge flower bud, which opens and shows a bunch of little purple flowers, each of which makes way for a tiny banana. The great flower cluster hangs toward the earth, but as the separate fruits begin to grow, they turn upward. From 50 to 150 bananas, weighing altogether from 40 to 100 pounds, may grow in a bunch, and their lower ends point upward. A bunch of bananas as displayed in a store is hung bottom side up.

Distribution and Kinds. The banana thrives in a hot, moist climate, and is raised in the tropical regions of both the eastern and the western hemispheres. Though native to the Old World, in the Americas it thrives on most of the West India islands, and along the coasts of the Gulf of Mexico and the Caribbean Sea, from Vera Cruz to the mouth of the Amazon River. Hawaii, California, Florida, and Louisiana each produce a small crop, and Florida promises to increase production to a point where shipments can be made to outside markets. The greatest banana section in the



SEEDS OF BANANAS

Photos: U & U; Saint Clair

Few people know anything about the seeds of bananas. In the cultivated variety, the seeds have degenerated; were it not so, every time you bite into the fruit you would get a mouthful of seeds. Seeds are found only in the wild varieties. In the upper right-hand illustration their location is shown. The other pictures are of seeds exhibited in the Field Museum in Chicago.

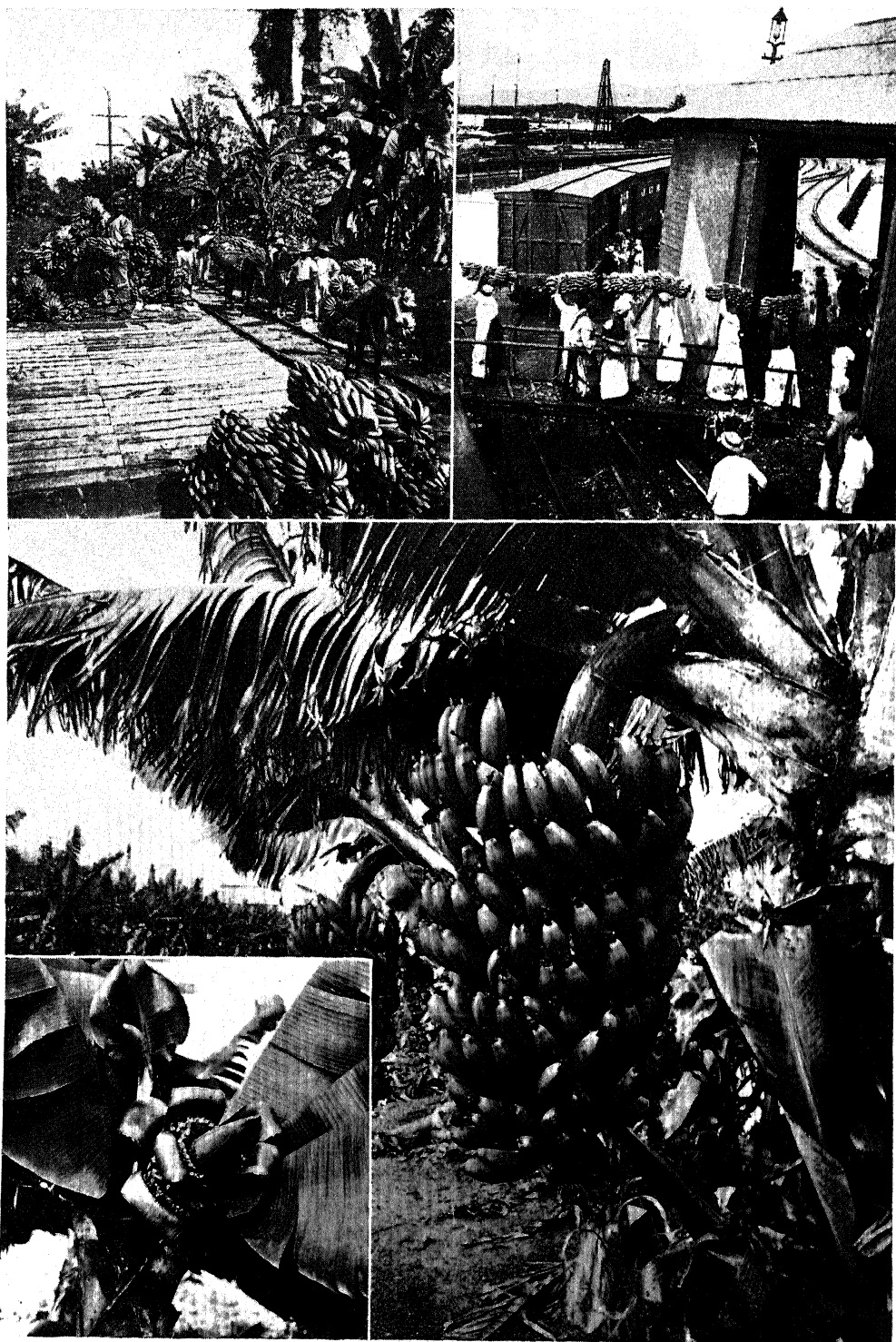
world is in Central America, although there are single groves in Colombia containing 100,000 acres.

The varieties of bananas commonly used as fruit in America are forms of *Musa sapientum*. The best-known varieties are the large, yellow, smooth-skinned Martinique and the smaller red Jamaica, or baracoa. The latter has a very pleasing flavor, but easily breaks from the stem, and so does not bear shipping well. There is a large cooking banana, never eaten raw, that goes by the name of *plantain*. This is classed as *M. paradisiaca*; by some authorities it is regarded as a subspecies, or variety, of *M. sapientum*. Dwarf varieties of the banana plant are commonly used in landscape gardening, but *M. cavendishii*, the Chinese Dwarf, or Cavendish, banana, is a well-flavored edible sort that is being reared on some plantations in Central and South America because it is highly resistant to disease.

Banana Culture. The commercial propagation of the banana dates from the latter half of the nineteenth century. Natives and white settlers in the tropics had long been raising the fruit for local consumption, but its possibilities as a commercial product were unsuspected until about 1866. Plantations were established first in the tangled jungles of the American tropics, and the task involved not only the clearing of land, but the building of railways and roads, of villages and sanitary works, and the organization of transport facilities and communication by telegraph. To-day the scientific propagation of the plant is carried on extensively in both hemispheres, for the demand for this wholesome fruit never fails.

Varieties of banana grown for fruit do not produce seeds, but are propagated from root-stocks or suckers, the latter of which spring up freely about the base of the plant. Each stem produces fruit once, and then dies down; new fruit is borne on shoots that spring from the top of the old stem. The fruit is harvested green when intended for shipment, and ripens in transit or in warm storage houses after being landed. The United States alone imports about 43,000,000 bunches annually.

Uses and Food Value. For the most part, the fruit is the only portion of the banana plant used, and the leaves and stalks, which must be cut down after the fruit has matured, are thrown away. Some species, however, produce a useful fiber, and the leaves of certain kinds are used for roofing houses and to make mats, bags, and baskets. The uncooked banana is most wholesome and nutritious when the peel is of a yellow-brown color. An unripe banana contains a large proportion of starch, which changes into sugar in the process of ripening. An uncooked green banana is as hard to digest as a raw potato. When cooked, however, the fruit becomes readily digestible; many delicious dishes are prepared by the natives in banana-producing countries by baking the green fruit in hot ashes. In countries which depend upon importations, cooked bananas are also finding favor; they are fried, made into croquettes or fritters, cooked with ham or bacon, and prepared in other ways. For cooking purposes, it is always preferable to use unripened fruit. Banana flour, which is a common article of diet in the tropics, is coming elsewhere into use. It is made by grinding the dried, unripened fruit. It has been estimated that one

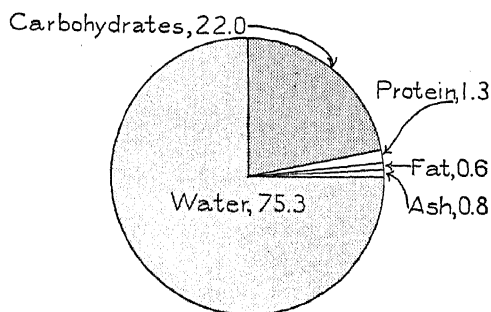


Photos: U & U; Visual Education Service

The Banana Industry. The large illustration shows the plant and fruit; the latter grows upward on the stem. The upper pictures portray a banana plantation in Costa Rica and a loading scene in Jamaica, where much of the work is done by native women; in the lower corner is a blossom of the banana plant.

pound of banana flour is equal in nourishment to two pounds of wheat flour, and it has been found of special value as an ingredient of milk mixtures for infants.

The banana is the only sweet fruit which can be obtained fresh and in a good condition in



COMPOSITION

Three-fourths of the edible part of the banana is water.

all parts of a country at all seasons. It has the further advantage of being put up by nature in a germ-proof package, for its inedible peel constitutes an air-tight protection against every form of germ or dirt. Its water content is lower than that of apples and oranges, but it is superior to either of these fruits in actual nutritive value. Its energy value is 460 calories per pound (see CALORIE). The banana also contains three valuable vitamins, A, B, and C (see VITAMINS).

B.M.D.

BANCROFT, GEORGE (1800-1891), an American statesman and historian, whose best-known production, a history of the United States, is yet a standard work on that subject. He was born at Worcester, Mass. After his graduation from Harvard College in 1817 and several years' study in Europe, he became a teacher of Greek in Harvard. Feeling restricted by the conventional atmosphere of the Cambridge school, he joined a friend in the organization of a high school at Northampton, Mass. While teaching there, he was elected to the state legislature on the Democratic ticket, but declined to serve.

A Political Career. He had become well known in Democratic politics by the time of

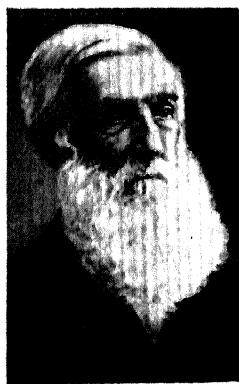


Photo: U & U

GEORGE BANCROFT

Martin Van Buren's election to the Presidency (1836), and was appointed by that official to be collector of the port of Boston. Nathaniel Hawthorne was one of his appointees while he was filling that position. Bancroft became President Polk's Secretary of the Navy in 1845, and served until 1846, when he was sent as minister to London. For a short period in 1846, he also acted as Secretary of War. During the time he was in the Cabinet, he lent his influence toward the establishment of the Naval Academy at Annapolis, and had much to do with shaping its policies. In the same administration, while acting as temporary Secretary of War, he gave the order for the American forces to march into Texas (see MEXICAN WAR).

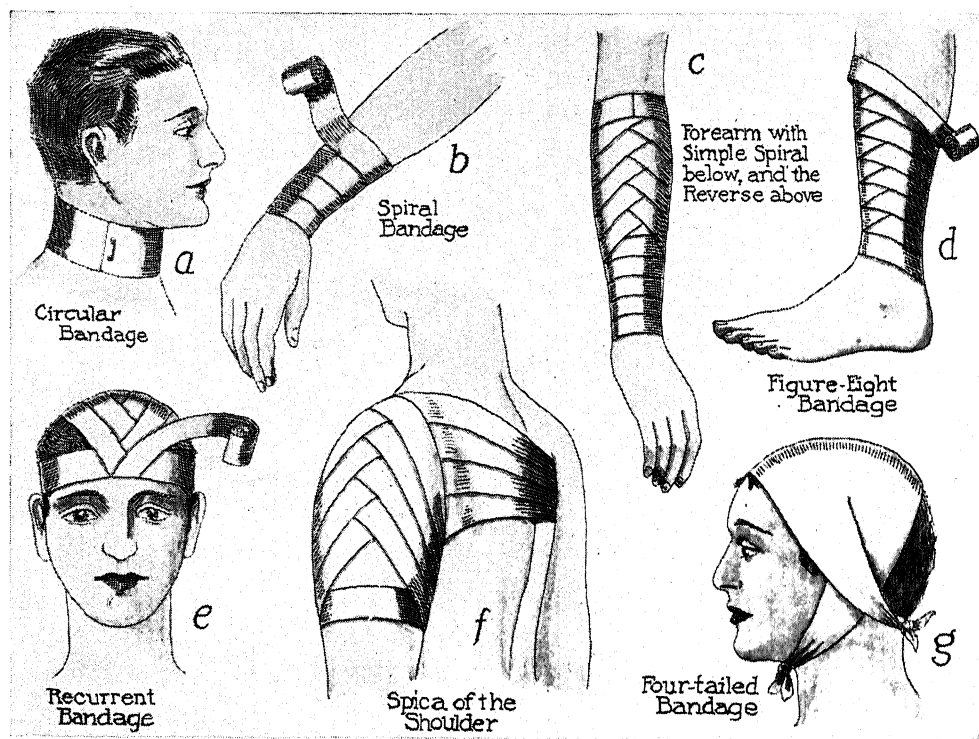
His services to his country continued into his later years, for he was selected by Congress in 1866 to deliver a special oration in honor of Lincoln, and in 1871 was appointed minister to the new German Empire. On April 27, 1886, he delivered at Washington, D. C., his last public oration.

Literary Productions. Bancroft's first published work was a collection of poems and translations, issued in 1823, and after that time he gave much of his energies to writing. The first volume of his *History of the United States* was published in 1834, and at intervals other volumes were issued, the last revised edition of the completed work appearing in 1884-1885. This work stamps him as one of America's leading historians, and reveals painstaking preparation, breadth of scholarship, and imaginative insight into the affairs of nations. He was also the author of numerous orations, political addresses, and magazine articles.

BANCROFT, HUBERT HOWE (1832-1918), an American historian, whose voluminous *History of the Pacific States* represents a collection of manuscripts, pamphlets, and books to the number of 60,000. He was born at Granville, O., and in 1852 went to San Francisco, where he became a bookseller. His deep interest in the history of the Pacific coast region led him to devote himself to the work of compiling a complete and original history of the Pacific states, and the results of his labors, begun in 1856, were turned over to the University of California in 1905. Some of the material was dictated to him by prominent pioneers of the West.

Other Works. Bancroft was also the author of the *West American Historical Series*, in thirty-nine volumes. His later writings include *The Book of Wealth*, and *Retrospection, Personal and Political*.

BAND, a combination of musical instruments that may be played in harmony, comprising drums and such wind instruments as can be played while the players are marching. In theory, no device that cannot be carried by a man on foot can enter into a grouping of band instruments, although in the development



VARIOUS FORMS OF BANDAGES

of this kind of music, many great bands now seldom play except when seated, and some of these have added several instruments too cumbersome to carry.

There had been no attempt at musical organization of any kind until after the middle of the thirteenth century, when wandering pipers and trumpeters joined together in guilds. The first of these was probably that of the Brotherhood of Saint Nicholas, organized in 1228 in Vienna. From these guilds, town bands developed throughout Germany and Austria, in which the trumpets and kettledrums were reserved for the nobility. At first, these musicians played no written music, in order to make their order seem more secret, but at the close of the seventeenth century their music began to be written, and its monotony was relieved by the introduction of trumpets tuned in other keys. The development of the band as we know it to-day owes much to two Belgian-French instrument makers, father and son. These were Joseph (1791-1865) and Adolphe (1814-1894) Sax.

In addition to the *fife and drum corps*, which is a popular form of band in America, bands are chiefly of two types—*brass bands* and *military bands*. The former, in addition to bass and snare drums, have only cornets and trombones, while the latter have other wind instru-

ments as well—clarinet, piccolo, flute, oboe, and saxophone. The military band is therefore able to achieve a far wider range of effects, and the brass band is generally made use of only where no band of the military type is available.

Military Bands. As the name strictly implies, military bands are connected with a military body, such as an infantry or cavalry regiment, but the term has been broadened to include citizen organizations that have adopted the instruments named above which distinguish the military from the brass band. A number of military bands in America have had noteworthy careers as concert bands, and have fallen not far behind orchestras in the enthusiasm which they have aroused. In the United States, Patrick Sarsfield Gilmore (1829-1892) had more to do than any other one man with the increased efficiency and popularity of military bands; and later, John Philip Sousa, trained in the United States Marine Band at Washington, the foremost organization of its kind in the United States, came prominently before the public as a leader of concert bands.

Related Subjects. See ORCHESTRA; SOUSA, JOHN PHILIP; also list of topics following the article MUSICAL INSTRUMENTS.

BANDAGE, cloth of certain shapes used in surgical treatments. Besides the designation

above, a bandage made of rubber and known as a rubber bandage is in use; likewise, a combination of cloth and rubber is used under the name *elastic bandage*. A plaster of paris bandage is a cloth bandage saturated with plaster. Cloth bandages are made of a variety of fabrics. As a rule, all bandages are long and narrow, and are designated by their width, as one inch, three inches. The word *bandage* is also given to the dressing as applied, an appropriate adjective being used.

A circular bandage is one that encircles a part of an affected area, each layer overlying the layer beneath. A spiral bandage is one in which each layer partly covers the preceding layer. As a rule, a spiral bandage is used to cover the arm. A spiral reverse is a spiral in which the bandage is turned over on each turn around the part. It is used on a part which is uneven in circumference, as, for instance, the leg. A figure-of-eight is a double spiral reverse; it is especially suited for markedly uneven parts, such as the lower leg and around joints. For various forms of bandages, see the accompanying figure. See FIRST AID TO THE INJURED. W.A.E.

BANDELIER NATIONAL MONUMENT. See NEW MEXICO (National Monuments); MONUMENTS, NATIONAL.

BANDERILLERO, *bahn de reel ya' ro*. See BULLFIGHTING.

BANDICOOT, the common name of a genus of Australian mammals which have shrewlike heads and ratlike tails. In common with the kangaroo and other marsupials (which see), the female bandicoot has a pouch in which she carries her young. As in the Tasmanian wolf, the pouch opens backwards. Bandicoots live in burrows and feed on insects, worms, mice, and vegetable food. They often are a pest in gardens. Theso-called *rabbit bandicoot* is a related species, with enormous, rabbitlike ears. In India, the name is given to a large rat, which is a rodent, not a marsupial. L.H.



BANDICOOT

Scientific Names. Bandicoots belong to the family *Peramelidae* and the genus *Perameles*. The rabbit bandicoot is *Peragale lagotis*.

BANDING OF BIRDS. See BIRDS (Bird Banding).

BANDIT, OR BRIGAND, *brig' and*, one of a band of robbers or highwaymen who live in secluded spots or in mountains. Around some of them many thrilling tales have been woven. Because of the violent, plundering ways of the hired soldiers who held the city of Paris in 1358,

during the imprisonment of King John, the name was first applied to them.

Robin Hood, the gallant, liberal, reverent outlaw of song and story, is the most celebrated brigand in British history. Later came Dick Turpin, the highwayman. For years, in Germany, the so-called robber barons held the southern part of the country at their mercy. Spain has always been a particularly favorable field for bandits. Don José Maria, a principal character in Mérimée's *Carmen*, is probably the most famous. In Italy, Fra Diavolo, the cruel bandit monk, practiced his profession.

In the United States and Canada, brigandage has taken chiefly the form of robbing banks, office safes, trains, and automobile trucks. Jesse James, the daring central figure among American train-robbers of a generation ago, has been followed by the automobile bandit. Brigandage has sometimes taken the form of kidnaping (which see). See ROBIN HOOD; FRA DIAVOLO.

BANFF, *banf*, ALTA., one of the most famous summer and winter resorts in America. It lies at an altitude of 4,500 feet, at the southeastern end of Rocky Mountains Park, and is visited each year by thousands of tourists to the Canadian Rockies. The scenery in the vicinity of Banff is declared by many critics to be superior to that of Switzerland. Banff itself exists only for the entertainment and comfort of tourists. It is unique among Canadian towns in that it has no mayor or aldermen, all control being in the hands of the park superintendent, who is appointed by the Dominion government. All land is owned by the Dominion, and is occupied under leaseholds.

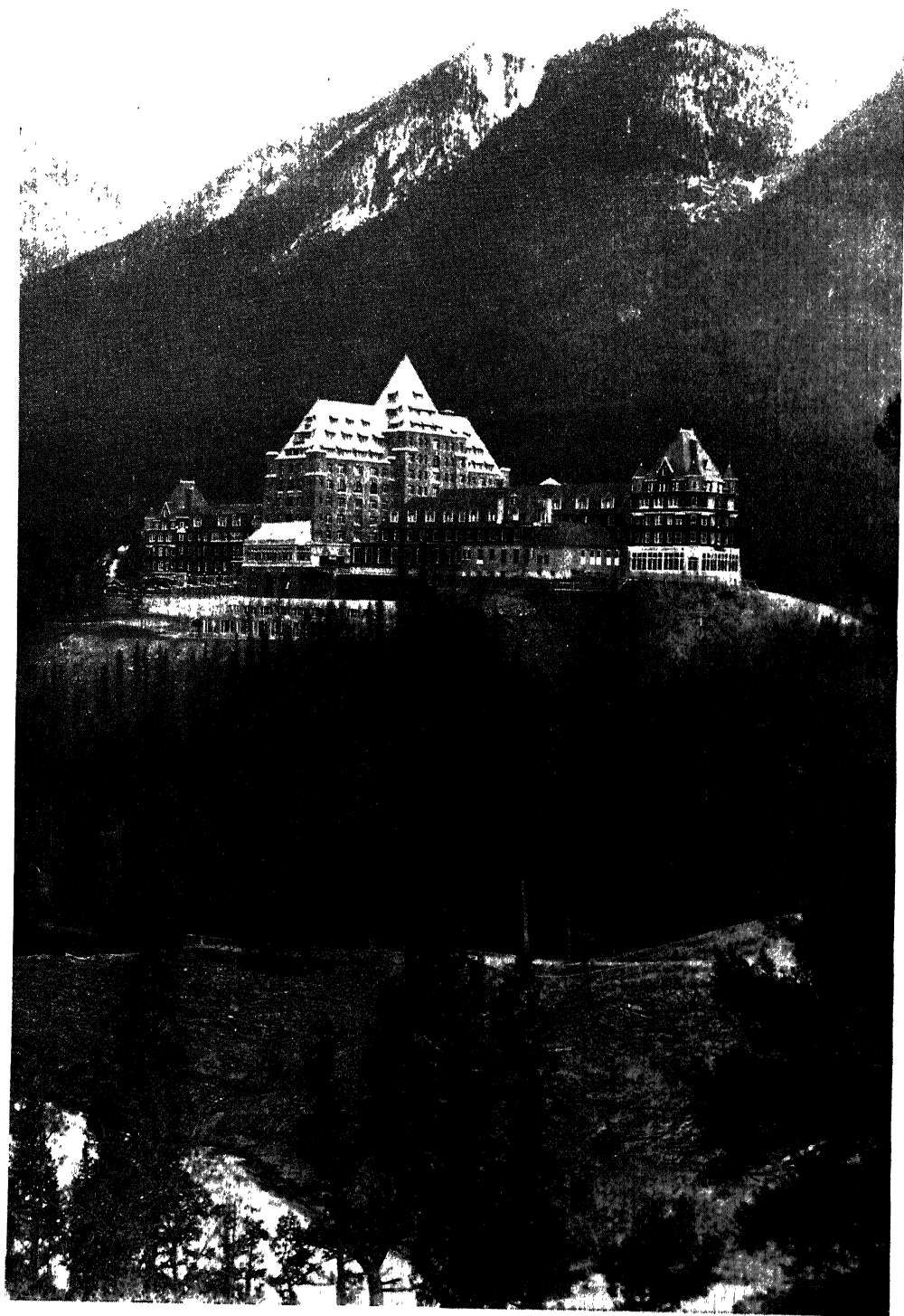
Banff was settled in 1884, and was named for the Scotch town from which Baron Mount Stephen emigrated to Canada. It is eighty-two miles west of Calgary, on the Canadian Pacific Railway, about 600 miles east of Vancouver, and about fifteen miles east of the boundary between British Columbia and Alberta. The permanent population is about 2,100. See illustration, page 600.

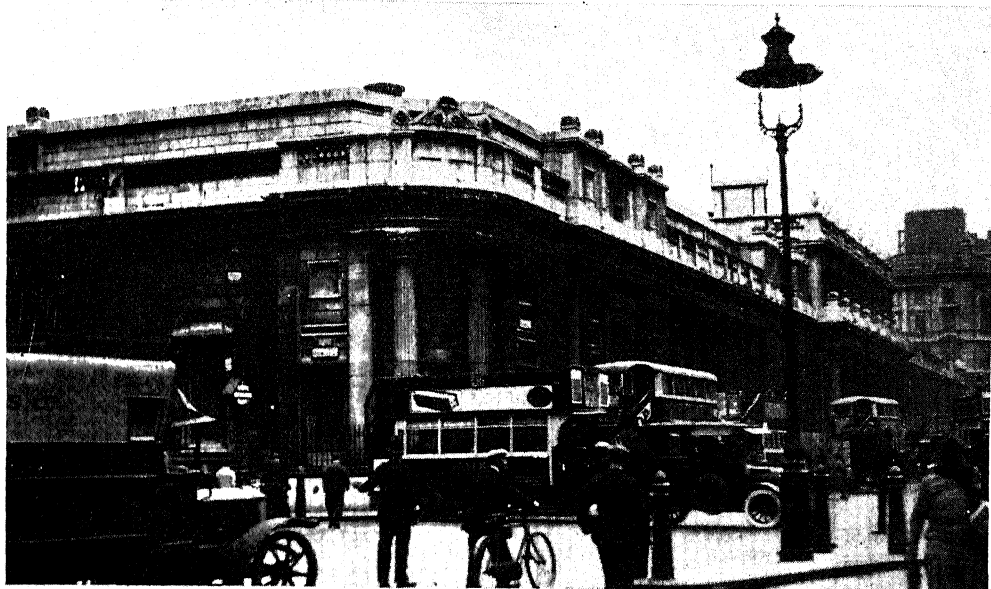
BANGALORE, *bang ga lohr'*. See INDIA (Cities).

BANGKOK, capital city of Siam (which see).

BANGOR, ME. See MAINE (back of map).

BANGS, JOHN KENDRICK (1862-1922), an American novelist whose stories were widely read and greatly enjoyed because of their original and delightful humor. He was born at Yonkers, N. Y. After his graduation from Columbia University in 1883, he studied law in his father's office for a year and a half, and then took an editorial position in connection with the humorous periodical, *Life*. Later he was associated with *Harper's Magazine*, *Literature*, *Harper's Weekly*, *Metropolitan Mag-*





BUILDING OF THE BANK OF ENGLAND

Photo: U & U

azine, and *Puck*. Stories came very rapidly from his pen after the first one was published, in 1886, all characterized by breezy humor and containing many laughable situations, yet showing the author's insight into the vagaries of human nature.

His Writings. *Coffee and Repartee* is a collection of stories that has been described as "a mixture of Oliver Wendell Holmes and Bill Nye." Other well-known titles are *The Idiot*, *Mr. Bonaparte of Corsica*, *A House Boat on the Styx*, *Mollie and the Unwise Man Abroad*, and *A Line O' Cheer for Each Day of the Year*. *Tiddledywinks Tales* was the first of a series of stories for children. He also wrote the musical plays, *The Worstest Man*, *Lady Teazle*, and *Tomorrowland*.

BANGUI, *ban ga'*, capital of Ubanga-Sheri colony, in French Equatorial Africa (which see).

BANGWEOLO, *bang we o' lo*, an African lake. See **AFRICA** (Surface).

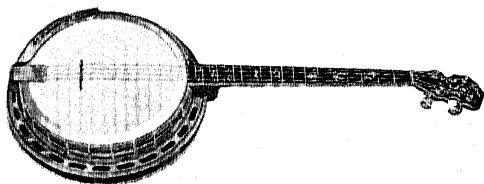
BANIAN, *ban' yan*, a variant of banyan (which see).

BANISHMENT. See **EXILE**; **OSTRACISM**.

BANJO, a stringed musical instrument, with a long neck and a body which consists of a circular frame like the head of a drum, over which is stretched a covering of parchment. The strings, made of catgut, are generally five in number. It is played by pressing the strings with the fingers of the left hand and twitching or striking them with the right-hand fingers. The so-called *tenor-banjo* has four metal strings, and is played with a plectrum, a small, hard piece of metal or bone, with which the strings are struck. For instrumental solos, duets, and other combinations, the

banjo is in demand wherever quick and lively music is desired, though never found in the orchestra.

The banjo has always been a special favorite among the negroes. In *Notes on Virginia*



BANJO

Thomas Jefferson referred to the banjo as an instrument "proper to the blacks, which they brought hither from Africa, and which is the original of the guitar, the chords being precisely the four lower chords of the guitar." In Guinea, the African negro still uses the *bania*, a form of banjo which has grass strings.

BANK, SAVINGS. See **BANKS AND BANKING**.

BANK, STATE. See **BANKS AND BANKING**.

BANK DISCOUNT. See **DISCOUNT**.

BANK FOR INTERNATIONAL SETTLEMENTS. See **INTERNATIONAL SETTLEMENTS**.

BANK OF ENGLAND, one of the most powerful financial institutions in the world. It was founded in 1694, a charter constituting practically a monopoly of English banking being granted to certain persons who loaned £1,200,000 (\$6,000,000) to the government for use in the war then being waged against France. From that date, the Bank of England

has been the bank of the government, and it has entire management of the national debt. For this service it receives annual payment at the rate of \$1,500 per million on the first \$30,000,000 of the debt, and \$450 per million on all above that sum. In addition to this, the bank is allowed to profit by all transactions in the field of legitimate banking.

Many banking corporations in the United States and in European and English cities have far larger capital and deposits than the Bank of England commands, but the latter derives its great influence not from the money it actually handles, but because it is the accredited financial representative of the British government and people. This influence is far more powerful than vast aggregations of capital. The original capital, consisting chiefly of the loan made to the English government, has been many times increased, until it is now nearly \$100,000,000.

The building occupied by the bank is situated in the center of the busiest part of London, almost directly opposite Mansion House, at the corner of Threadneedle Street; hence it is frequently alluded to as the "Little Old Lady of Threadneedle Street"—a term of respect rather than of ridicule. There is nothing romantic or architecturally beautiful to distinguish it from any other building, except that it is perhaps a little more somber than its surroundings. Extensive additions to the building were made in 1925. A new, reconstructed bank building is expected to be completed by the year 1935. The board of directors meets weekly, when a statement is issued showing the financial status of the bank, in accordance with a law passed in 1844. F.H.E.

BANK OF THE UNITED STATES. In 1789, when the Constitution of the United States went into effect, there were only three banks in the country. They had a small note circulation in the cities in which they were situated, but most of the people in the states had never seen a bank note (paper money). Alexander Hamilton, Secretary of the Treasury, proposed that the government should charter a bank which would issue a national paper currency and would be the financial agent of the United States.

There was much opposition to Hamilton's plan. Some critics declared that the bank would merely enrich a few capitalists at public expense; others said that it would be an "aristocratic institution, intended to pave the way to a monarchy." The most serious objections came from the followers of James Madison and Thomas Jefferson, who argued that the Constitution did not give Congress the specific right to charter any corporation. Washington, who was then President, asked Hamilton and Jefferson to prepare written statements of their views, and these papers are among

the great documents of American history. In them were clearly outlined the doctrines of "strict" and "broad" construction of the Constitution, the doctrines which were to form later the basis of political parties.

The First Charter. Congress and the President adopted Hamilton's view, and on February 25, 1791, the Bank of the United States was chartered for a term of twenty years. Its main office was at Philadelphia. The capital was \$10,000,000, of which the government took \$2,000,000. The paper money issued by the bank was legal tender for all debts due to the national government. Its large capital and its branches in New York, Boston, and other cities gave it a great advantage over the state banks, and it easily dominated the banking system, much as the Bank of England still does in Great Britain (see **BANK OF ENGLAND**). The government sold its stock after a few years, and when the charter expired, in 1811, the national government had no vital interest in the bank. The opposition of the state banks was strong enough to prevent the renewal of the charter.

The Second Charter. During the War of 1812, most of the state banks suspended specie payments, with the result that the paper currency of the country was in a greatly disordered condition. Some bank notes were worthless, some were worth perhaps ten cents on the dollar, a few were worth fifty cents or thereabouts on the dollar, and probably none could be exchanged at par.

Under the circumstances, there arose a demand for a new Bank of the United States. The second bank was chartered on April 3, 1816, with a capital of \$35,000,000, of which the government subscribed for one-fifth. The bank was the official depository for government money, and it was the agent for the national and state governments. It prospered, and in a few years seemed as firmly established as the government itself. It had large deposits, and its notes were as good as gold, not only in the United States, but also in European countries.

The bank's power had made enemies, but there was no organized opposition to it until Jackson became President. Two of Jackson's supporters in New Hampshire complained that the Portsmouth (N. H.) branch of the bank was being mismanaged. In charge of the branch was one Jeremiah Mason, one of Jackson's bitterest opponents, and chiefly for political reasons the bank was doomed. Mason was defended by the bank's officers, while Jackson, disregarding the Mason episode, charged that "both the constitutionality and the expediency of the law creating this bank are well questioned by a large portion of our fellow citizens."

Practically the whole of Jackson's first term was taken up with the fight against the bank. Jackson finally vetoed a bill to extend its char-

ter, and after his reflection he ordered the withdrawal of the government's deposits. The bank was compelled to terminate its affairs, as practically the whole of its deposits were funds belonging to the United States.

F.H.E.

Related Subjects. For political details of the fight against the bank, see JACKSON, ANDREW (Administration). See, also, BANKS AND BANKING (Banking in the United States); HAMILTON, ALEXANDER, who was the financial organizer of the government; and TYLER, JOHN (Administration).

BANKRUPT, a person who is recognized by law as unable to pay his debts. The property of a bankrupt may be seized by his creditors, acting under the orders of a court, and it may be divided among them in proportion to the amount due each. The word is derived from the Italian; it really means *bank* and *broken*, and refers to the old Italian custom of breaking the benches used by money-lenders and bankers when they failed. In modern times, the property of a bankrupt is not destroyed, but merely taken from him.

(Originally, in English law, there was a distinction between *bankruptcy* and *insolvency*, and this distinction is still kept in most countries. A *bankrupt* must have been a person engaged in business, and only his creditors could petition against him. Persons not engaged in business could become *insolvent*, but only on their own petition. Modern English and American laws no longer recognize this distinction, but divide bankruptcy into two parts, *voluntary* and *involuntary*. A debtor himself may petition for relief from his debts by bankruptcy; this is voluntary bankruptcy. If his creditors petition, it is called involuntary (not voluntary) bankruptcy, even though he offers no protest. A corporation cannot file a voluntary petition, even if it desires to do so; it must always be petitioned against.

In the United States. By the terms of the Constitution, Congress has power to establish "uniform laws on the subject of bankruptcies throughout the United States." The individual states are allowed to legislate on the subject, provided the state law conforms to the national statute. The present national act was passed in 1898, and has been several times amended. Petitions in bankruptcy, whether voluntary or involuntary, must be presented to the Federal court in whose district the bankrupt lives, and also where he has his place of business. The judge may hear the petition, or may refer it to a referee in bankruptcy or a master in chancery, to take testimony. Final decisions rest with the court. See RECEIVER.

The Five Acts of Bankruptcy. The law specifies five classes of acts which justify the court in declaring a person or corporation bankrupt. Even if a person has committed any of these acts he may prevent a decree against him if he can convince the court that his property is

sufficiently valuable to pay his debts. The five acts are as follows:

(1) If the debtor conveys or removes, or allows to be removed, any of his property with the intention of defrauding any of his creditors. Any transfer of property during the four months preceding the filing of a petition in bankruptcy is void, and the property may be recovered by the creditors.

(2) If he transfers any of his property with the intention of preferring any of his creditors above others.

(3) If, being already insolvent, that is, unable to pay his debts, he allows any creditor to obtain a preferred claim through process of law.

(4) If he makes a general assignment of his property for the benefit of his creditors; or if he is already insolvent when a receiver is appointed for his property.

(5) If he admits in writing that he is unable to pay his debts and is willing to be legally bankrupt.

The Settlement. The court or the referee usually fixes a date for a hearing of the petition. At this hearing the creditors may present their claims, and either the creditors or the debtor may show cause for not decreeing bankruptcy. If the debtor is declared bankrupt, his property, by order of the court, is placed in the possession of a trustee. If the bankrupt owns a business, the trustee usually continues it, at least for a time, in order to preserve as far as possible the good will and other assets of the firm. Eventually, the property will be sold, and the proceeds will be divided among the creditors. However, the debtor may be *discharged* from bankruptcy before the sale of the property. Any debts unpaid are canceled by this discharge, unless they are based on fraud. A bankrupt may be criminally liable for violation of certain clauses of the law, and a discharge may be refused if he has been previously discharged three times within intervals of six years.

Political Disqualification. In the United States a bankrupt is not disqualified from voting or holding public office. Under the English law, however, he is not allowed to sit in either house of Parliament, nor may he vote for members of Parliament. There are a number of other specified offices from which he is disqualified. As soon as he is discharged, this disqualification ends.

In Canada. Under the British North America Act of 1867 the Dominion Parliament has sole control of bankruptcy, but there is no Dominion law now in force. A Dominion Insolvency Act was passed in 1875, but was repealed in 1880. Its failure was due chiefly to the differences in the provincial laws which were in effect before 1867. A Winding-Up Act, which applies only to banks, insurance and loan companies, was passed in 1882, but in all other respects it has been the policy of the Dominion government to leave the regulation of bankruptcy to the provinces.

F.H.E.



BANKS AND BANKING. Banks are considered, by the great majority of people, principally as safe places in which to keep such money as they do not need for immediate use. The worker in a factory possibly does not understand that the bank in his community may be a very important factor in promoting the business of his employer; his interest in it may center in the gradually accumulating deposit which he is laying up for himself and family. Even if banks had no function more important than this, there would be the very best of reasons for their existence; yet they could not exist unless they were permitted to be lenders as well as custodians of the funds of others.

The integrity of a good bank and the value of its services to depositors is well illustrated, though possibly by a somewhat extreme case, in the following incident:

The Case of Joseph Robbins. In the year 1860, Joseph Robbins, age thirty, first mate of a sailing vessel, carried to a bank in New York City \$1,000, to be held for him for safekeeping. He was given a pass book showing this deposit, and next morning he started on a long voyage around Cape Horn into the Pacific Ocean. After rounding the Horn, the vessel was wrecked, and four men, including Robbins, eventually reached an uninviting island shore, where they were forced to live a number of years, during which time two of the group died. In the course of time, they were rescued by a vessel which had been blown many miles off its course, and in a few weeks they landed in Australia. It answers our purpose only to know that thirty years after Robbins had set sail from New York, he was again in that city. He remembered his deposit, but had no evidence to prove its existence, for his pass book had been lost.

"I want to see the president of this bank," said an old man of sixty years, "upon an important personal matter." He was finally introduced to one of the vice-presidents.

"Have you a sum of money on deposit to the credit of Joseph Robbins?" he asked.

Investigation proved that such was the case, but why should this weather-beaten stranger be offered this information?

"I am Joseph Robbins, and I deposited with you \$1,000 the day before my last sailing from this port, thirty years ago. This is my first return visit. My pass book was lost when my boat went down, and I know no man in the city to-day who can identify me. What do you advise me to do?"

The banker learned that the boat Robbins named actually did sail on the date claimed; that Robbins

was first mate; that the vessel was never again heard from, except that wreckage was later reported by other vessels. Little by little the Robbins story was substantiated, and when the bank was assured of his identity, the man who had left \$1,000 for safekeeping in the hands of an institution he felt he could trust, was handed more than double that amount in cash, the original principal sum and its accrued interest.

The Business of Banking

A bank has two principal functions, namely, receiving from the people their money on deposit, and the loaning of money at interest, safeguarded by good security. The money which it receives on deposit is in turn loaned to other customers. A bank, therefore, is a middleman between those who have money to lend and those who want to borrow.

Functions of a Bank. The functions of a modern bank may be treated under two headings—banks as borrowers and banks as lenders. The term *borrow*, however, is not used here in a technical sense. Banks are custodians, keeping funds available for demand at any time, and the deposits of their customers cannot, in the real sense, be called loans. On the other hand, the moneys in their keeping are invested and made to produce, and are repaid to the depositors; thus the banks in effect act as borrowers. Every time a person deposits money in a bank, he virtually loans that money to the bank.

Banks as Borrowers. The man who entrusts his money to a bank does not, as a rule, think of his deposit as a loan; in fact, he usually puts his money in a bank for safekeeping or for convenience, but the bank uses the money to lend to those who need it. This is the greatest service which a banker performs for the community. He collects as deposits small amounts which would lie idle and unproductive, and he is then in position to lend larger amounts for productive enterprise.

The money which a bank receives on deposit is usually subject to repayment on demand. It may be drawn out by the depositor in person, or on his written order. Such an order is a *check* (or *cheque*). The depositor pays his debts by ordering the bank to pay money from his account to a third person. He need not carry on his person large sums for which he has no immediate use, and he has a

further advantage in that the check, when endorsed and paid, is a receipt for the payment he has made.

The bank renders another important service to the depositor. A large commercial bank each day receives hundreds of checks from its depositors which it credits to their accounts. These checks may be drawn on many different banks, but the bank in which they are deposited collects them all. If a check is drawn on a bank in a distant city, a small charge, called *exchange*, is usually made for the service. If the check is drawn by one depositor in favor of another depositor in the same bank, payment of the check is merely a matter of making proper entries in the books of the bank. If the check is deposited for collection at another bank than that on which it is drawn, the payment is seldom made by the transfer of cash, but usually through the *clearing house* (which see). Besides collecting checks, a bank will collect for its customers money due on notes, bond coupons, and other commercial paper.

If money deposited in a bank is regarded strictly as a loan, the depositor is entitled to interest. The many services which a commercial bank renders to its customers, however, are usually considered to outweigh this right. On small checking accounts, a bank almost always loses money, the expenses of keeping records of them being practically as much as in recording large accounts. It takes as much clerical work to record a deposit of \$10 as one of \$1,000. For this reason, most banks fix a minimum balance which a depositor is expected to keep, if he wishes to draw checks against it. This minimum may range from \$50 in a small-town bank to several hundred dollars in a large city. Some banks require a small service charge per month (in most cases \$1) of a depositor whose account is below a certain minimum average.

For people who want interest on their deposits, a savings account is always recommended. Most banks now have savings departments, and there are also many special savings banks. These usually pay interest at the rate of 3 or 4 per cent a year. Under normal conditions, a savings bank will pay its depositors on demand, but it reserves the right to ask previous notice, usually of sixty days, to prevent demands which might occasion embarrassment if a good portion of its funds were out on time loans. A modern savings bank, viewed as a borrower, has practically the same functions as the earliest banks in Europe. It receives money on deposit, and issues a receipt, in the form of a *pass book* or *bank book*, which is merely a convenient way of keeping a number of receipts together. If the depositor wants to draw all or part of his money, he must take

his pass book to the bank, where the proper deduction is entered on his account.

In large cities, the banks sometimes become borrowers in a technical sense, borrowing sums of money at fixed rates of interest and promising payment on or after specified dates. In such cases, *certificates of deposit* are issued as evidence of the banks' obligations. Such sums are really lent, and they are not subject to withdrawal by check. It should be noted that the aggregate of certificates of deposit of all the banks in the United States, both state and national, would represent but a very small percentage of the total deposits of all the banks.

Banks as Lenders. Loans by banks are either *call loans* or *time loans*. Call loans must be repaid on demand; time loans are made for a definite period. Banks usually lend money on commercial paper, or on personal notes secured by the deposit of *collateral*, usually stocks or bonds. In the majority of cases, the borrower gets his loan in the form of a deposit credit, against which he may draw checks. In cities, where the check system is fully developed, this is sufficient; but in country districts, where checks are not accepted so freely, a substitute is sometimes needed. Country banks sometimes issue certificates of deposit in lieu of notes accepted for discount, but this course is rather unusual and is not approved by the best banks.

The money which a bank lends is either its capital or the deposits it has received. Its capital, incidentally, must be enough to inspire confidence in the public. The larger the bank's capital, the more the bankers themselves have at stake, the greater the feeling among the depositors that the bank will be managed conservatively. Practically the whole of the bank's capital can be used in its business. Of its deposits, however, a varying portion must be held as a reserve. The bank's customers are constantly adding to and drawing from their accounts, and the bank must keep enough cash on hand to meet ordinary demands. At certain periods, for example, in the harvest season, the banks are usually paying out larger amounts than they are taking in. Experienced bankers make allowances for such conditions. If the bank is unable to meet the demands made upon it for cash, it is said to *suspend payment*, and is usually forced to discontinue its business. If the public has not lost confidence in the management, a reorganization, perhaps with the addition of new capital, may take place. On the other hand, it is the business of the banker to anticipate demands and have currency ready, but if demands are unexpected and he has paper of value, he can always rediscount this paper with the banks in reserve cities, if not with the Federal Reserve Bank; thus he has the ability to supplement

his cash with quick returns by the rediscount of paper of a certain character.

Banks organized under charters from the Canadian and United States governments are required by law to keep their reserves at a point thought to be safe in normal times (see *Bank Reserves*, below). In some states, however, there is no restriction on private bankers, who are thus allowed to keep any reserve they think is adequate. The danger from this source has been often demonstrated, and the regulated banks, those under the supervision of the state or nation, are always using their influence to secure legislation on the subject. But as yet there are many states in which there is no law to prevent anybody from displaying a sign, "Bank," and taking all the deposits he can get. If he proves to be reckless or dishonest, the depositors may be able to have him imprisoned, but in such a case they are almost sure to lose their savings.

Trust Companies. A trust company may or may not be a bank. In some of the Eastern states the trust company has no general banking powers, but throughout the South and West, it is more likely to be a general bank. As the name indicates, trust companies were originally chartered to perform the duties and assume the responsibilities of trustees of estates. The advantages of such organization are clear; the company is a corporation, and it exists indefinitely, while an individual trustee may die at any time after he is appointed. The care of estates naturally means that such a company has the money of estates to invest, and also investment propositions which need money. Trust companies frequently act as fiscal agents for corporations.

Origin of Banking. In its simplest form of money-changing, banking is as old as history. Ancient writers often referred to the money-changers, the men who bought foreign money and gave domestic coins in exchange. By the end of the fifth century of the Christian Era, banking was a recognized business, and bankers not only exchanged actual money, but dealt extensively in credit. The code of Justinian, which was compiled in A.D. 529, shows that there were many laws on the subject of banking at that time.

The beginning of modern banking, however, is usually assigned to the year 1587, when the Banco di Rialto was established at Venice. As we know from Shakespeare's *Merchant of Venice* and other sources, private bankers had conducted business there at earlier dates. The Banco di Rialto, and its successor, the Banco del Giro, received deposits payable on demand, issued receipts for them, and allowed them to be transferred on written orders. The receipts were commonly used in Venice as money. The Bank of Amsterdam and the Bank of Hamburg

were founded about the same time, and exercised the same functions. The receipts which they issued for deposits were commonly called *bank money*, or *current money*.

Banking in the United States. The history of banking in the United States properly began in 1782, with the chartering of the Bank of North America. In colonial days, there were no banks in the sense in which the word is used to-day. There were a few organizations, called banks, which issued notes, but they did not receive deposits or carry on any other feature of a general banking business. So insignificant, indeed, were they, that the name *bank* was frequently given to the paper money issued by them and by the colonies. Most of the colonial governments at one time or another issued notes as loans to private individuals, who offered mortgages, silverware, horses, and other property as security.

All this confusion came to an end in 1789, for the individual states, under the terms of the Constitution, were not allowed to issue notes. The Congress of the Confederation had already chartered three banks, the Bank of North America at Philadelphia, the Bank of New York at New York City, and the Bank of Massachusetts at Boston. Then, in 1791, Congress chartered a new bank, larger than any of the others and more closely connected with the Federal government—the Bank of the United States (which see). For twenty years this bank dominated the banking system of the country. There were a number of state banks, however, whose combined influence was strong enough to prevent a renewal of the bank's charter in 1811.

Then followed a five-year period of hopeless confusion and depression, during which most of the state banks suspended specie payments. At the close of the War of 1812, the demand for the "old regulator" grew strong, and in 1816 Congress issued a charter for the second Bank of the United States. This bank, like the first, prospered, but through no fault of its own the renewal of its charter became a political, not a financial, question. The bank incurred the enmity of President Jackson, whose efforts were chiefly responsible for its end in 1832, when he vetoed a bill for the renewal of its charter.

The next twenty-five years included two periods of great expansion among state banks, and two periods of depression and general suspension of specie payments. Previous to the financial crises of 1837 and 1857, there was a rapid growth in the number of state banks and their deposits and loans. But the banking expansion was merely one phase of the mushroom development of the country. The craze for "internal improvements" meant plenty of money and large paper profits for banks, and many banks did a flourishing business on little

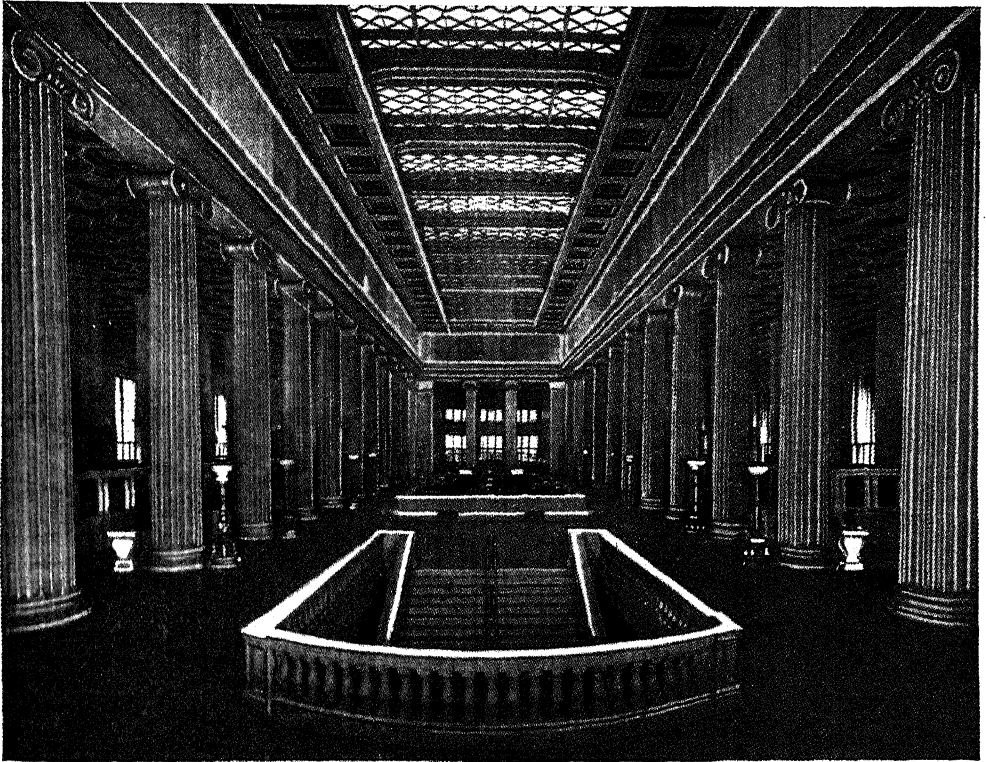


Photo: Illinois Merchants Trust Company

INTERIOR OF A MODERN BANK IN A GREAT CITY

The stairway from the banking floor leads to the street level.

or no capital. When the crash came in 1837, practically every bank in the country suspended specie payments. During the whole of this quarter-century, bank notes were constantly changing in value, and weekly guides were published showing the current values and discounts. When 800 or 900 banks were each issuing five or six different kinds of notes, it required more than memory to know which ones were safe. Added to the large number of good notes were hundreds of counterfeits and countless pieces of paper labeled "notes," and issued by banks which never existed, called "wildcat banks."

In 1846 Congress attempted to end all connection between the banks of the country and the government treasury by establishing a system of treasury branches in the large cities. This system was considerably modified, and is no longer a factor in our banking system. The first change came soon after the outbreak of the War of Secession.

National Banks. The beginning of the War of Secession made large demands on the credit of the national government. One of the duties presented to Congress was the devising of some new plan of banking. Instead of a confused and unstable system which had

prevailed for twenty-five years, the government needed a unified and absolutely safe system, one that would operate in every part of the country. After much discussion, a new law was drafted and passed in February, 1863. This law was faulty in a few minor respects, and was replaced by one of June 3, 1864.

The new system provided for the establishment of *national banks*, and these were placed under the supervision of an officer in the Treasury Department, the Comptroller of the Currency. Each national bank was allowed to issue notes, on the basis of bonds purchased by it from the government. At least thirty per cent of a bank's capital was to be invested in United States bonds, which were then to be deposited with the Treasurer of the United States, and the bank was allowed to issue notes up to ninety per cent of the par value of the bonds. These notes were made legal tender for all debts except customs duties. The minimum capital for a national bank in a city of more than 6,000 people was fixed at \$100,000; the minimum in smaller communities was fixed at \$50,000. The currency law of 1900 contained an amendment which fixed \$25,000 as the minimum capital for a bank in a town of less than 3,000 inhabitants.

The system as adopted included a number of notable improvements. In the first place, the bank notes were printed under the direction of the government. They were uniform in design, and as the banks were required to keep adequate reserves, they were uniform in value throughout the country. The note of a Chicago bank was then worth as much in New York as in New Orleans. The holders of these notes were protected by the bonds which formed the basis for the note issue. The depositors in national banks were given good security for their money, for the law made the stockholders liable for the bank's debts to the extent of double the amount of their holdings of stock. More important still, national banks were required to keep their accounts in a uniform manner and submit them on demand to inspection by government examiners.

The state banks were slow to see the advantages of the new system, and at the beginning of 1865 there were only 638 national banks. It seemed as though one of the primary objects of the law, to secure a market for government bonds, had failed. To hasten the reorganization of state banks, Congress passed a law placing a tax of ten per cent on their note circulation. By the time this tax went into effect, on July 1, 1866, 1,000 more banks had received national charters. The number of national banks increased gradually, until in 1900 it was about 3,600. Largely because the act of 1900 reduced the minimum capital from \$50,000 to \$25,000, the number of banks increased gradually to over 8,000.

Banking Reform. The inflexibility of the national banking system was plainly evident in 1903 and during the financial panic of 1907. In the latter year, the Aldrich-Vreeland Bill, providing for the issuance of emergency currency, was passed, but no bank ever cared to take advantage of the law lest such action be regarded as evidence of extreme weakness. The need for new monetary legislation became more and more evident, and in 1910 the Senate of the United States appointed a National Monetary Commission, under the chairmanship of Senator Nelson W. Aldrich, to investigate the whole question of banking reform. The Aldrich plan, as proposed in a report issued in 1911, called for a National Reserve Association, which was practically a central bank.

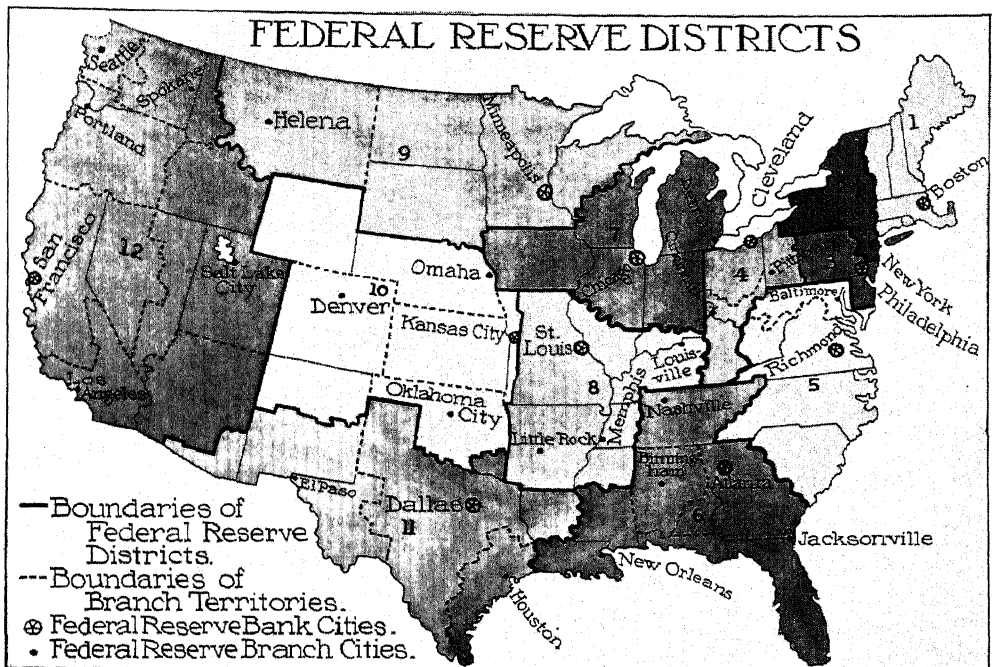
It was soon evident, however, that the report of the commission would carry no weight, and that the public was fearful of a central bank. Accordingly, the National Citizens' League was organized to create a public sentiment in favor of some banking system, and this organization put out a platform which, for three years, was pressed home to the people by publicity methods, until the country was ready, in 1911, to support Congress in the framing of a new

monetary measure. The work of the National Citizens' League continued for a period of about three years, and it cost between \$500,000 and \$600,000, but it was so effective that when the Banking and Currency Committee of the House took up the question of forming a banking bill, they had the country behind them with an almost unanimous insistence that such a bill should be passed. The system created by the law of 1913, the present Federal Reserve System, differs from the plan of the Aldrich Commission chiefly in that the function of issue lies with the Federal Reserve Board, and the concentration is in twelve centers, instead of one. A feature of the Aldrich plan which did survive was a provision for district associations and for branches of the district associations. These latter have never been put into operation.

Federal Reserve Banks. The locations of the twelve Federal Reserve Banks created by the act of 1913, and the districts which they serve, are shown on the accompanying map. Every national bank in the United States must subscribe six per cent of its capital and surplus to the stock of the reserve bank in its district. State banks may subscribe, but are not required to do so. As the capital and surplus of individual banks vary from year to year, the capital of the reserve bank varies, but the minimum capital is \$4,000,000.

Each reserve bank is under the direction of a board of nine directors, three of whom are bankers named by the member-banks of the district, three of whom are citizens, not bankers, but named by the banks, and three of whom are appointed by the Federal Reserve Board at Washington. The Federal Reserve Board is in supreme control of the entire system. It is composed of the Secretary of the Treasury and the Comptroller of the Currency, who are members *ex officio*, and six other members appointed by the President for terms of ten years at yearly salaries of \$12,000. Two of these five members must be experienced bankers, but must have no connection with any bank during their term of office.

The primary function of a Federal Reserve Bank is to rediscount commercial paper. A national bank, for example, presents to the reserve bank notes which it has discounted for its own customers. The reserve bank rediscounts the notes, thus releasing the funds of the national bank. In ordinary times, the reserve bank will pay for such commercial paper out of its current funds, but if there is a great demand for money, and if much paper is being presented, it will pay for them in what are known as Federal Reserve notes. These notes are issued in denominations of \$5, \$10, \$20, \$50, and \$100. If the demand increases, the supply automatically keeps pace. A reserve bank is not allowed to pay out the notes



FEDERAL RESERVE DISTRICTS

The twelve districts and branch territories, and location of the Reserve Bank and branch cities in each.

of another, except on the payment of a ten per cent tax. This tax is prohibitive, and hastens the retirement of notes as soon as they have served their immediate purpose. The United States Treasury will redeem in gold all Federal Reserve notes presented to it, and, as required under the laws, the reserve banks keep in the Treasury a redemption fund for this purpose.

One of the three directors of each bank, appointed by the Federal Reserve Board, is designated *Federal Reserve Agent*, and the notes are in his custody until they are needed. To secure the notes, the reserve bank must deposit with this agent the Federal Reserve Board paper which it is rediscounting. As an additional security, it must maintain at all times, no matter what general financial conditions may be, a gold reserve of forty per cent of the face value of the notes.

Besides making the currency more flexible, the law of 1913 extends the privileges of national banks. With the approval of the Federal Reserve Board, any national bank whose capital and surplus total \$1,000,000 may establish branches in foreign countries. Any reserve bank may also buy and sell in the open market, either at home or abroad, various kinds of commercial paper. Another notable feature is that the banks in the United States are for the first time allowed to recognize the peculiar needs of agriculture. A Federal Reserve Bank

may discount ordinary commercial paper for ninety days, but it may discount for six months any paper issued for agricultural purposes. In addition, there have been established, under Federal law, Federal Land Banks, Joint-Stock Land Banks, and Federal Intermediate Land Banks to provide credit for the benefit of agriculture. Such loans must not exceed twenty-five per cent of the bank's capital and surplus and fifty per cent of the value of the farms mortgaged.

Bank Reserves. Under the old law of 1864, there were three cities, New York, Chicago, and Saint Louis, which were "central reserve cities"; besides, there were a number of "reserve cities." The law of 1913 keeps this distinction. In the central reserve cities, member banks must keep a cash reserve of thirteen per cent of their demand deposits and three per cent of their time deposits. In the other reserve cities, only ten per cent of the demand liabilities must be kept in reserve, and in all other cities only seven per cent is required. In every bank, however, three per cent of its time liabilities is the minimum reserve. Only a part of the reserves, however, need be held in the bank's own vaults; the remainder must be placed on deposit with the Federal Reserve Bank of the district. This bank, in turn, must keep on hand at all times a cash reserve which may not fall below thirty-five per cent of its total deposits.

Branch Banking. A very important bill affecting the banking system of the United States, called the McFadden-Pepper Bill, became a law in 1927. This law was particularly desired by national banks, which had been at a serious disadvantage in competing with state banks whose charters were more liberal than those granted to national institutions. Because of restrictions contained in the National Bank Act, many national banks had surrendered their charters and reorganized under the laws of their states. It was believed that the new law would be very effective in checking such tendencies.

When the Federal Reserve Act was adopted in 1913, Congress conferred much added prestige on state banking institutions which elected to enter the Reserve System, for until that time, state banks in general were regarded as less safe than banks operating under national charters. The Reserve Act gave state banks an opportunity to participate in many of the advantages of the national bank system. The act gave state banks all the advantage of national banks except the right to issue bank notes, and yet national banks did not have some of the privileges of state banks.

The whole trend of national banking legislation since 1913 has been to equalize functions, and permit the national banks to carry on practically the same functions as state banks and trust companies.

Under the law of 1927, a national bank in a city, town, or village of not less than 25,000 population may establish branches in the city if maintenance of branches is permitted to state banks under state laws. A state bank converted into or consolidated with a national bank may retain branches previously in lawful operation. The same provision applies to consolidations of two or more national banks in any community.

An important limitation upon branch banking by state banks was placed in the law. There is no limitation upon the practices of state banks as such, but a state bank which holds or seeks to acquire stock in a Federal Reserve Bank—in other words, which is or seeks to be a member bank of the Federal Reserve System—may no longer operate branches outside of the city in which it is located. Thus are its opportunities somewhat curtailed.

The new law, further, gave national banks indefinite charters, instead of limiting them to a stated period. It also formally acknowledged the right of national banks to enter investment banking, and it set up new standards of safety for dealings in securities. The law liberalized the rules concerning national-bank loans on real estate, permitting loans up to five years, instead of only for one. It also allowed national banks to make relatively larger loans to farmers.

Group banking, the union of banking interests over a wide territory, is a plan which gives financial strength to all member banks. Each bank in the combination holds stock in the parent corporation.

Labor Banks. Many of the prejudices existing between capital and labor have been removed through better understanding during recent years. No single influence has been more potent in giving labor an insight into financial affairs than the organization and control of numerous banks by strong labor unions. The late Warren F. Stone (1860-1925), for many years president of the powerful Brotherhood of Locomotive Engineers, saw an opportunity for labor to engage profitably in the banking business and to keep for itself the profits from such enterprises, rather than to place the money of union men in the hands of banks owned by others.

He organized the Coöperative National Bank of Cleveland, and its establishment has led to the development of more than a dozen other banks within as many years. All of these are controlled in stock ownership by members of labor unions. Each bank is organized and conducted under national or state banking laws.

Savings Banks. Until modern times Christian people were forbidden by their Church to accept interest in return for the use of their money. This prohibition and that in *Deuteronomy*, "Thou shalt not lend upon usury to thy brother" (in which *usury* means merely interest, not excessive interest), were justified by the fact that in former days people never borrowed money unless in trouble, when kindness would inspire a gift instead of a loan. But with the advent of the age of capital and industry, and the development of the idea that those who do not have present need of their money can serve the world by lending to those who are able to employ it productively, religious objections to interest vanished. Toward the end of the eighteenth century, men began to see that the interest which could be earned might encourage people who otherwise squandered their earnings to realize, with Ben Franklin, that—

A penny saved is two pence clear,
A pin a day 's a groat a year.

Then the churches began to encourage the establishment of savings banks, the first of which had been founded in Brunswick, Germany, in 1765.

Though the first savings banks in the United States, founded in 1816, were called the Philadelphia Savings Society and the Provident Institution of Boston, savings banks in America have on the whole been business enterprises rather than charitable foundations. In the United States there are two important classes of savings institutions, the *mutual* banks,

OUTLINE AND QUESTIONS ON BANKS AND BANKING

Outline

I. Functions of the Bank

- (1) As borrowers or custodians of funds
 - (a) Safekeeping of funds
 - (b) Use of the check
 - (c) Collection of checks on different banks
 - (d) Checking accounts
 - (e) Savings accounts
 - (f) Actual borrowing of banks
- (2) As lenders
 - (a) Call loans
 - (b) Time loans
 - (c) Collateral
 - (d) Form of loan
 1. Deposit credit
 2. Certificates of deposit
 - (e) Lending of capital
 - (f) Lending of deposits
 1. Necessity for reserve
 2. Dangers of unrestricted private banks
- (3) Trust companies
 - (a) May or may not be banks
 - (b) Advantage over individual trustees
- (4) Labor banks
- (5) Savings banks
 - (a) Postal savings banks
 - (b) School savings banks

II. History of Banking

- (1) Origin
- (2) Beginnings of modern banking
- (3) Banking in the United States
 - (a) In the colonies
 - (b) The Bank of the United States, 1791
 - (c) State banks
 - (d) Second Bank of the United States, 1816
 - (e) Growth of state banks
 - (f) Wildcat banks
 - (g) National banks
 1. Government supervision
 2. Minimum capital
 - (h) Banking reform
 1. Aldrich plan
 2. Federal Reserve Banks
 3. Banking reserves
- (4) Law of 1927
 - (a) Extends privileges
- (5) Banking in Canada
 - (a) In colonial times
 - (b) Governmental control
 - (c) Recent laws
 - (d) Method of organization
 - (e) The reserve question

Questions

What different meanings attached to the word *banks* in colonial times in America?

What is the greatest service which a bank performs for a community?

What are the two great advantages of a check?

What play of Shakespeare's tells something of banking methods in early modern times?

What did the National Citizens' League accomplish?

How large a capital must a Canadian bank have to secure a government charter?

Under what circumstances may the depositors of a savings bank not receive their deposits on demand?

What was the popular name for the Bank of the United States in its early days?

Under what conditions may one reserve bank pay out the notes of another?

Why cannot a bank be run without capital, solely with the funds of its depositors?

How did the War of Secession affect banking in the United States?

What is the difference between a "central reserve city" and a "reserve city"?

If a depositor in a bank draws a check in favor of another depositor in the same bank, how is the matter adjusted?

How many Federal Reserve Banks are there?

How much must each national bank subscribe to the reserve bank of its district?

How does Canada deal with the question of bank reserve?

OUTLINE AND QUESTIONS ON BANKS AND BANKING—Continued

How did the banking law of 1927 operate to the advantage of national banks?
What are branch banks?

In your opinion, judging from what you know of banks from observation, is stock in banks a desirable investment?

Why is it absolutely necessary that banks be lenders as well as custodians of funds?

What is the difference between a call loan and a time loan? Can you give reasons why call loans are made?

Has the establishment of Federal Reserve Banks given to the national banks any new privileges?

What is the advantage of a trust company over an individual trustee?

Give briefly statistics showing the increase in the number of national banks in the United States.

What is the oldest bank in Canada, and what is its present status?

Why is no interest usually paid on checking accounts?

When was the first Bank of the United States chartered, and how long did it exist?

How many directors has a Federal Reserve Bank, and how do they obtain their office?

Why cannot small independent banks exist in all the cities of Canada? What makes up for this lack?

What was the Aldrich-Vreeland Bill, and why did it have no effect on the banking conditions of the country?

How are matters arranged in Canada so that all the banks are responsible for the payment of the notes of each bank?

Why is it not safe to deposit money in a private bank, that is, one not under government supervision?

What were the advantages of the banking system established in the United States in 1864 over that previously in force?

About what is the total capital stock of the banks of the United States? What are their combined resources?

What are certificates of deposit?

Why was it necessary at one time to issue weekly statements as to the value of bank notes?

What are the duties of a Federal Reserve Agent?

What is meant by the "double liability" of stockholders? Is it in force both in the United States and in Canada?

May a bank safely loan all of its capital? All of its deposits? Why?

What are the functions of a clearing house?

Why was the establishment of special "savings" banks considered necessary? Have they proved their worth?

Where are the Federal Reserve Banks located?

About what is the total capital of the chartered banks of Canada?

What is meant by *collateral*, and of what does it usually consist?

What is the smallest sum that may be deposited in a postal savings bank?

How large a sum may one depositor have to his credit?

What restrictions as to farm mortgages are placed on national banks by the McFadden-Pepper Act?

What provision is made in Canada for the revision of banking laws?

What is the object of school savings banks, and how have they accomplished their purpose?

What were "wildcat" banks?

whose depositors are its owners, and the more numerous *stock* banks, whose stockholders make a profit by investing the money given to them as savings. For both types, the state government, in order to protect depositors, usually prescribes the nature of investments that may be made. But though these banks guard \$10,000,000,000 in savings for more than 15,000,000 people, the greater part of the savings funds of the country are in the savings departments of regular banks. Depositors are paid three per cent or four per cent interest on their savings.

Postal Savings Banks. England was the first country to utilize in a savings plan the organization of the postoffice and the confidence which people feel in their government. The English system was inaugurated in 1861, and was copied in Canada six years later. Though nearly all prominent nations have had postal savings banks for a number of years, the United States did not establish them until 1910.

In order to insure that postoffice banks shall benefit only those whose funds are small, there is a rule in Canada that the deposits of any one person must not exceed \$1,000 in any one year, nor total more than \$3,000. In the United States, the regulation is that the total interest-bearing deposits of an individual shall not be above \$1,000, but larger amounts are accepted if the depositor is willing to accept no interest. No one may deposit less than one dollar at a time, but savings of smaller amounts may be made by securing a ten-cent card and attaching ten-cent stamps to it until it is worth one dollar. Two per cent interest is paid in the United States; three per cent, in most other countries.

School Savings Banks. In Europe, special banking arrangements for school children have existed for a century, but in the United States only since 1885. The usual method is for a school to accept deposits from its children, and to place the total sum in a savings bank. When a child has a certain sum, say one dollar, to his credit, he is given an individual account. Money cannot be withdrawn except in the presence of a parent or guardian, and with the written consent of the teacher. Millions of dollars have been saved in this manner by American children. The stamp system is less successful because stamps may be lost or sold.

State Banks are banks chartered by state authority and conducted under strict supervision. A national bank, except in a town of less than 3,000 people, must have at least \$50,000 capital, but a state bank may operate with half that capital, in small cities. The banking methods of the two do not differ in any material respects in their relation to customers. The state government makes periodic examination of the condition of these banks.

Banking in Canada. To secure a government charter, a bank must have a capital of \$500,000,

one-half of which must be paid in before the charter is granted. While the organization is being perfected, this sum of \$250,000 is in the custody of the government. The laws of the Dominion fix the details of the process of organization. A director of the bank is required to own at least three per cent of its stock; if its capital is \$1,000,000, he must invest \$30,000. The par value of all bank shares is \$100. As in the United States, stockholders have a "double liability"; in other words, if the bank fails, and its assets are not enough to pay its debts, a stockholder is liable for an added \$100 for every \$100 share he owns.

In the United States, national banks, as explained above, are required to keep a fixed percentage of their deposits as reserve. In Canada there is no fixed reserve, the only requirement being that forty per cent of whatever reserve a bank does keep must be in legal tender. A restraining influence on reckless financing is exerted by the Canadian Bankers' Association and by the fact that a detailed statement of the bank's accounts must be sent to the government each month.

The large capital required before a Dominion charter may be issued makes it impossible to establish independent banks in all the cities which need banking facilities. Canadian chartered banks, however, establish branches throughout the Dominion, and there is no town of consequence without one or more branches. Each branch has its own local manager, its own depositors, and its own accounts, but the manager is responsible to the home office. There are at present about twenty chartered banks in the Dominion, and over 3,000 branch banks. The authorized capital of these chartered banks amounts to nearly \$189,000,000, and the reserve fund is considerably over \$113,000,000. C.B.H.

Related Subjects. The reader is referred in these volumes to the following articles:

Bank of the United States	Exchange
Check	Specie Payments
Clearing House	Wildcat Banks

BANNOCKBURN, *ban' uk burn*, BATTLE OF, one of the decisive battles of history, fought at Bannockburn, Scotland, in 1314. In this battle Robert Bruce (which see) won independence for his country by his victory over Edward II of England, and secured for himself the throne of Scotland. The English had the advantage in numbers, the Scotch in position, and the latter further aided their cause by digging a number of military pits along the line of the enemy's advance. The English were totally routed, losing 10,000 foot soldiers and 200 knights out of their army of 60,000. The Scottish army, 40,000 in number, suffered a loss of 4,000. The ringing lines of Burns's *Bannockburn*, the first stanza of which follows, contain the words that the poet

fancied Bruce addressed to his soldiers just before the fight:

Scots, wha hae wi' Wallace bled;
Scots, wham Bruce has after led;
Welcome to your gory bed,
Or to victorie!

Bannockburn, the village, is about three miles southeast of Stirling, on the Bannock rivulet. Though



Photo: Visual Education Service

BATTLE OF BANNOCKBURN

The battle-axe and the spear were the deadly weapons of the fourteenth century.

its population is less than 3,000, it has important manufactures of tweeds, carpets, tartans, and leather. An object of interest in the town is the stone in which Bruce set his flagstaff before the famous battle.

BANNOCKS. See BREAD.

BANNS OF MARRIAGE, a public announcement, usually read in a church, of the intention of a man and a woman to be joined in marriage. The custom of publishing marriage banns originated in the desire of the Church to protect its young communicants from harmful or unsuitable unions, for anyone who hears the banns read is privileged to object to the approaching marriage if he knows of any reason why it should not take place. The great Catholic Council of Lateran, held in 1215, ordered banns to be published before the marriage ceremony in every Christian country. The custom is still generally practiced in Roman Catholic countries and in England, and it also prevails among the Roman Catholics of Canada and the United States.

BANSHEE, *ban' she*, in the imagination of the old Irish and Celtic people generally, an old woman, identified with the fairies, whose presence was made known by shrieks and wailings. Whenever these were heard, they were accepted as a warning of impending death in the family. Except in a few isolated sections, belief in banshees no longer exists.

BANTING, **FREDERICK GRANT** (1891-), the discoverer of insulin, a corrective for

diabetes mellitus, was born on a farm near Allison, Ont. In 1911 he entered the University of Toronto, but before completing his course, he enlisted in the World War. The army being in need of physicians, he was ordered back to school, and after graduation again joined the colors as a physician, with the rank of captain. He was wounded in the hand in the line of duty, and for conspicuous bravery close to the front, was awarded the Military Medal.

After the war he settled in private practice in London, Ont., and took the post of demonstrator in the medical school of that city, to enable him to add to his funds so that he could pursue research studies. He became interested in a cure for diabetes, and abandoning his pecuniary interests, he returned to the University of Toronto to work out his theories. The university authorities ably seconded his efforts, with the result that he and his associate, Dr. J. J. R. MacLeod, were able to give to the world a most valuable agent for the treatment of diabetes. Banting was awarded the Nobel Prize in medicine in 1923; this honor and its emolument he shared with his associate. See DIABETES; INSULIN.



FREDERICK GRANT
BANTING

BANTU, *ban too'*, the name applied to a large group of native negro tribes of Central and South Africa, all speaking languages derived from one original tongue. The best-known Bantu-speaking people are the Zulus. The Basutos are an offspring of the Zulu nations, by emigration and intermarriage with Kaffir tribes, as are also the Matabele, the Swahili, and the Bechuanas. With the exception of the Hereros, the Bantus are all agriculturists, and understand the arts of pottery-making, weaving, and iron-smelting. Many of them raise cattle. Until recent years, however, their principal occupation was war on other native tribes. See BASUTOLAND; AFRICA (The People). C.W.

BAN' YAN, or **BANIAN**, a remarkable tree of India, which may in itself reach the size of a grove or small forest. The peculiar feature of this tree and of some other tropical fig trees is the method of growth. In the first place, it does not always begin its growth on the ground. Seeds are dropped by birds in the tops of palm trees, where they speedily germinate, sending down roots to the soil, and, in time, killing the tree on which they grow.

Then, as branches develop, these throw down supports, which take root as soon as they touch the ground, enlarge into trunks and extend branches in their turn, eventually covering a wide extent of ground.

As the Hindu word for trader is *banian*, it is probable that the tree is so named because Hindu merchants frequently spread their goods in the shade of these tree-forests. One of the most famous of the banyan trees is that in the Botanic Garden at Calcutta, with a main trunk thirty feet in circumference and with 230 smaller trunks. The largest banyan tree known, on the island of Ceylon, has 350 great trunks and over 3,000 smaller ones. A certain banyan, famed in history, was so huge that it is said 7,000 men camped under it. Banyan wood is soft and porous, and from its white, sticky juice bird-lime is sometimes prepared. G.M.S.

Scientific Name. The banyan tree belongs to the mulberry family, *Moraceae*. Its botanical name is *Ficus bengalensis*.

BAOBAB, *ba' o bab*. See SENEGAL.

BAP'TISM, a Christian ceremony or rite by which a person seals his vows to God and the Church. While on earth, Christ commanded His disciples, "Go and teach all nations, baptizing them in the name of the Father, and of the Son, and of the Holy Ghost." Before Christ gave His commission to the Disciples, John the Baptist had preached repentance and had baptized many, and Christ came to him to be baptized in the Jordan.

Baptism was established as a requirement for admission to the Church of Christ from the beginning. On the day of Pentecost, "Peter said unto them, Repent and be baptized every one of you in the name of Jesus Christ for the remission of your sins, and ye shall receive the

gift of the Holy Ghost. Then they that gladly received his word were baptized." Wherever churches were established, converts were baptized. The baptism of John signified repentance for sin; that ordained by Christ, the reception of the Holy Spirit.

At first, all baptism was by complete immersion, and some denominations, particularly the Baptist, still hold to that mode, but the method of sprinkling or pouring is now in use in most Protestant churches. The ceremony varies in minor particulars in different denominations, but the significance of the rite is the same in all.

Infant Baptism. The Roman Catholic and Greek Reformed churches baptize infants, as do most of the Protestant denominations. When the infant is baptized, he is dedicated to Christ and the Church, but the conditions upon which the child may in after years be admitted into full membership in the Church vary widely among the different denominations.

Christening, as its meaning, *making Christian*, indicates, is identical with the ceremony of baptism. In popular usage, however, the word is used particularly to refer to the giving of a name, whether or not the ceremony is religious. This general use is evident in the phrase "to christen a ship," etc.

Naming in baptism, or christening, has its basis in early Christian rites, when an individual embracing Christianity assumed a new name to signify a spiritual

rebirth. Like rites exist in other religions.

Godparents, individuals, other than the parents, who act as sureties for a child's religious training and upbringing when it is baptized into the Christian Church. After the Reformation, all of the reformed churches except the Lutheran put this duty upon the parents.

BAP'TISTS, a Protestant denomination which traces its origin as a distinct community to the Protestant Reformation. The first



Photos: P & A

BANYAN TREES

The upper illustration is that of a banyan in Florida, near Hollywood, which is said to be valued at \$2,000,000. Below, a banyan in the Botanic Garden at Kandy, Ceylon.

church which called itself by this name was the Particular Baptist, formed in London in 1683, by certain members who peaceably seceded from a Separatist community. Three years later there was a further secession, and the conviction arose in the new group that the proper form of baptism was by immersion (see BAPTISM).

The first Baptist church in America was probably organized by Roger Williams in 1639, although this is disputed, the claim being made that the first Baptist church of Newport, R. I., with John Clarke as its pastor, antedates the above. So great was the opposition to those early Baptists in New England that for nearly a hundred years after the time of Roger Williams there were but eight Baptist churches in the entire colony of Massachusetts. Farther south, there was greater toleration. In the course of time, the Baptists were divided into three groups—Northern, Southern, and National, the latter representative of the African race. These divisions are still retained; they do not imply any differences in doctrine, but are largely for administrative convenience.

While maintaining, with all other Protestant bodies, the great truths of the Christian religion, Baptists hold particularly to the following doctrines:

(1) That the churches are independent in their local affairs; (2) that there should be an entire separation of Church and State; (3) that religious liberty or freedom in matters of religion is an inherent right of the human soul; (4) that a Church is a body of regenerated people who have been baptized on profession of personal faith in Christ, and have associated themselves in the fellowship of the Gospel; (5) that infant baptism is not taught in the Scriptures, and is fatal to the spirituality of the Church; (6) that from the meaning of the word used in the Greek text of the Scriptures, the symbolism of the ordinance, and the practice of the early Church, immersion in water is the only proper mode of baptism; (7) that the scriptural officers of a Church are pastors and deacons; and (8) that the Lord's Supper is an ordinance of the Church observed in commemoration of the sufferings and death of Christ.

There are seventeen branches of the Baptists in America. They have about 63,000 churches, about 53,000 ministers, over 8,000,000 members, nearly 50,000 Sunday Schools, and about 4,500,000 members in the latter. The church in the Canadian provinces has about 420,000 members.

Baptist Young People's Union of America, organized in 1891 as a federation of all Baptist young people's societies in the United States and Canada. Its purposes are to develop Christian character, to encourage a wider knowledge of the Scriptures, to teach Baptist history and doctrine, and to cultivate a missionary viewpoint.

Since its organization, the Union has divided, in accordance with the church divisions, into the B.Y.P.U. South and the Northern B.Y.P.U.; the latter includes the societies of Canada. The mem-

bership of the two bodies is approximated at 500,000 and 200,000, respectively.

BARABBAS, *ba rab' as*, the murderer whom Pilate, the Roman governor of Judea, released to the Jews when he delivered Jesus to be crucified. According to the New Testament account, it was customary to pardon one or more prisoners during the Feast of Passover. Desiring to pacify the Jews and at the same time escape the responsibility of sentencing Jesus to be executed, Pilate said to the Jews, "Whether of the twain will ye that I release unto you?" They said Barabbas" (*Matthew XXVII, 21*). See PILATE; PASSOVER.

BARAK, *ba rahk'*. See TABOR, MOUNT.

BARANOFF, *bah rah' nof*, an island off the coast of Alaska (which see).

BAR ASSOCIATION, AMERICAN, a nationwide organization of lawyers, formed in 1878, whose object is "to promote the administration of justice and uniformity of legislation throughout the Union," and "to uphold the honor of the profession of the law, and encourage cordial intercourse among the members of the American bar." It is composed of members of the bar associations, of the various states; that is, any member of one of these associations is eligible to membership in the national body. Meetings are held annually.

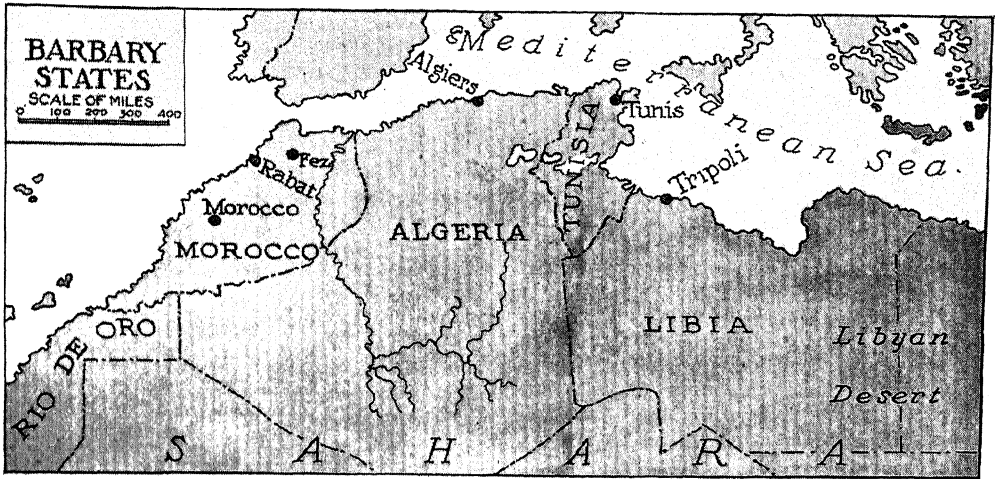
BARBADOS, *bahr ba' doze*, the most easterly of the West India Islands, possibly the most densely populated island in the world, averaging over 950 people for each of its 166 square miles. It is of coral formation, and is probably founded on a volcanic base, as it is subject to earthquakes. The climate is mild and healthful. In 1752 George Washington undertook the one foreign journey of his life when he accompanied his invalid brother Lawrence to Barbados.

The soil in the lowlands is very fertile, and large crops of sugar cane are raised. Other important products are cotton, coffee, tobacco, indigo, and arrowroot. The leading industries are the manufacture of sugar and rum, but the island has considerable commerce and important fisheries. The colored inhabitants outnumber the white people about nine to one. The capital is Bridgetown (population 16,650), on the only good harbor.

The island was discovered in 1518, was occupied by the British in 1625, and has always been a British possession. It is administered by a governor, assisted by an executive committee and a legislative council, all appointed by the British government, and a house of assembly elected by the people. Population, about 160,000.

BARBADOS EARTH. See the article RADIOLARIA.

BAR'BARA FRIETCHIE, *fre' chi*, the aged heroine of Whittier's poem of the same name, who risked her life to save her country's flag



THE BARBARY COAST OF AFRICA

from dishonor. The poem is based on an uncertain story that sprang up during the War of Secession, and was first published in the *Atlantic Monthly* in 1863. According to the story, the men of Frederick, Md., hauled down the American flag on the approach of the Confederate troops under Stonewall Jackson. Old Barbara Frietchie, "bowed with her fourscore years and ten," loyally set the flagstaff in her attic window, and when the Confederates, at the word of command, rent the banner with a blast from their rifles, she dauntlessly seized the flag and, in the words of the poem—

She leaned far out on the window-sill
And shook it forth with a royal will.

"Shoot, if you must, this old gray head,
But spare your country's flag," she said.

Stonewall Jackson was moved by her appeal,
for—

A shade of sadness, a blush of shame
Over the face of the leader came;

"Who touches a hair of yon gray head
Dies like a dog! March on!" he said.

A tablet marks the spot in Frederick where the incident is said to have occurred.

Barbara Frietchie is one of the best of Whittier's shorter narrative poems, and its martial ring, interesting story, and pleasing rhythm make it a great favorite with children.

BARBARIAN, a name given by the Greeks to everyone who spoke any language but Greek. Thus, when Saint Paul, in his *Epistle to the Romans*, said, "I am debtor both to the Greeks and the barbarians," he meant not uncivilized people, but simply non-Greeks. Originally the word had no unpleasant meaning, but naturally, because the Greeks thought themselves superior intellectually to any other people, it soon took on something of the modern

meaning—rude, uncivilized, and illiterate. The Greeks applied the term to the Romans, who in turn made use of it to describe all who spoke neither Latin nor Greek. The origin of the word is uncertain, but it probably was an imitation of some of the barbarous sounds of which, to the Greek ear, all other languages seemed to be composed. See **GREECE** (Ancient Greece).

BARBARISM. See **CIVILIZATION**.

BARBAROSSA, *bar bah ro' sah*, a surname given to Frederick I of Germany (which see). It means *Redbeard*.

BARBARY STATES, those countries in North Africa that lie along the southern shore of the Mediterranean Sea, whose modern names are Morocco, Algeria, Tunisia, and Libya (until 1912, Tripoli and Barca). They are inhabited by settled, and also by wandering, Arabs, Moors, Jews, Turks, negroes, a few Europeans, and by the Berbers, the original inhabitants, from whom the region takes its name. The Berbers are an important nomad people. See **NOMAD LIFE**.

Historically, the Barbary states are of great interest. Along the coast, in ancient times, the Phoenicians established thriving colonies and cities, the most famous of these being Carthage, renowned for its wealth and splendor. It was envied by the Romans, who sacked and destroyed it in 146 B.C. In the time of Emperor Constantine, the Romans held sway over nine provinces in North Africa, and the ruins of the great towns they built are to-day of great interest to archaeologists. The Moors, driven out of Spain by the Christians in the fifteenth century, settled in North Africa and began a career of piracy that made them for years the terror of Mediterranean seamen; European nations secured protection for their commerce only by the payment of tribute.

The United States, in the early years of its history as a nation, took the initiative in putting a stop to these outrages. In a war with Tripoli (1801-1804), in which the Americans distinguished themselves in many exploits, the ruler of Tripoli was forced to respect the sea rights of others. There was further trouble during the War of 1812, but in 1815 Algiers, Tripoli, and Tunis were glad to sign peace treaties with the United States when a fleet commanded by Stephen Decatur sailed into the harbors of their chief ports.

Turkey was once the dominant power in North Africa, but to-day Algiers is a French colony; Morocco and Tunisia are French protectorates; Tripoli, including Barca, was wrested from Turkey by Italy in 1912, and the name changed to Libia.

Related Subjects. The reader is referred in these volumes to the following articles:

Algeria	Libia
Berbers	Morocco
Decatur, Stephen	Tunisia

BARBECUE, *bahr' be ku*, a word of doubtful origin. It first signified the practice of roasting a hog, ox, or other large animal entire, on a



Photo: Visual Education Service

ROASTING OXEN

A typical barbecue, from a photograph taken in Mississippi.

rude gridiron of stakes placed in an open field. From this, the meaning of the word has been extended to apply to any open-air celebration where animals roasted whole and large quantities of other food and of drink are the leading attractions. Barbecues, especially in the West and South, were formerly often given in connection with open-air public meetings, but they have lost much of their popular character, and have been abandoned completely in most parts of the country.

Purveyors of roadside lunches for automobilists have appropriated the methods of meat preparation employed in the old-time barbecue. They therefore advertise barbecue meat as a part of the lunches they offer for sale.

BARBER, a word derived from the Latin *barba*, meaning a *beard*, and applied to one whose occupation is to shave or trim the beard and cut and dress the hair. In early days barbers also practiced surgery, but the two pro-

fessions were made distinct by an act passed during the reign of Henry VIII, by which the barber-surgeons were forbidden to perform any surgical operation other than blood-letting and tooth-drawing, and the surgeons were not to practice "barbery," or shaving. This practice continued until the time of George II.

The sign of the old profession—the pole with its stripes representing the bandage with which the barber wrapped the patient after blood-letting—is still retained by many barbers. In the United States barbers are organized in a powerful trade union which regulates wages, hours of work, and prices.

There are barbers' schools in which young men may learn the trade in a fairly scientific way, but many barbers begin their career in this trade as boys-of-all-work in a shop, and gradually learn the details. Many states have laws requiring barbers to be licensed.

The fashion of short hair for women, which lately become universally popular, largely increased the number of barbers and added many women to the profession. Both men and women barbers are found in hair-dressing and "beauty" shops, as well as in those devoted exclusively to the barber's trade.

Razors have been found in relics of the Bronze Age, and there are other evidences of the ancient nature of the barber's trade. Alexander the Great required his soldiers to shave regularly, so that the enemy could not grasp their beards, and the Egyptian men had elaborate equipment for beautifying the face and hair. In Rome and Athens, as well as later in France and Great Britain, the barber shops were places for discussion and gossip and for the meeting of artistic and literary men.

BARBER OF SEVILLE. See OPERA (Some of the Famous Operas).

BARBERRY, the name of a genus of low, spiny shrubs with attractive red fruit and bright-colored autumn foliage, several species of which are used in landscape gardening. The plants of this genus are distributed over the temperate regions of the world. The *common barberry* and *Japanese barberry* are especially suitable as ornamentals, but the former cannot be used in wheat-growing regions without injury to the grain, for it is subject to, and commonly infested by, the spring stage of black stem rust, a serious fungous disease of wheat. The common and Japanese barberries can easily be distinguished, and one need make no mistake in selecting Japanese barberry plants for shrubberies. The rust-immune Japanese species has a more compact habit of growth than the common barberry; its berries grow either singly or in pairs, instead of in clusters; it bears its spines singly on the stems, whereas the rust-susceptible species bears them in groups of three; and its leaves have smooth, instead of spiny, margins.

B.M.D.

Scientific Names. The barberry genus is *Berberis*, family *Berberidaceae*. The common barberry is *B. vulgaris*; the Japanese, *B. Thunbergii*.



BARBERRY

At left, Japanese barberry, with berries; at right common barberry, showing wheat rust on leaves

BARBER'S ITCH. See **ITCH**, subhead; **RINGWORM**.

BARBERTON, OHIO. See **OHIO** (back of map); **AKRON, O.** (Industries).

BARBIZON, *bahr be zon'*, **PAINTERS**, an important group of nature painters who lived and worked in the Barbizon region in France, near the forest of Fontainebleau. They were not a "school" of painters, any more than the Lake poets of England were a "school" of poets, but they had certain very definite ideas in common. These ideas they succeeded in making central in much of modern art. First of all, they insisted that every picture, whether it represented a landscape, a scene from peasant life, or a group of cattle, must be painted directly from nature; second, they believed that every picture must express the artist's mood. Coleridge gave voice to this idea when he said, "A poet ought not to pick nature's pocket; let him borrow, and so borrow as to repay by the very act of borrowing."

Some of the greatest of French artists were Barbizon painters, for Rousseau, Corot, Daubigny, Troyon, and Millet were numbered among them. Millet's peasant-life paintings stand as models of that sort of art; Troyon's cattle pictures have never been surpassed; and Corot's misty landscapes still hold their charm for artists and the public. American artists were greatly influenced by the Barbizon principles, and Inness, the foremost landscape painter of the United States, is almost as typical a Barbizon painter as if he had belonged to the group. See **PAINTING**; **MILLET**, **JEAN FRANÇOIS**.

BARBULES. See **FEATHERS**.

BARCELONA, *bahr se lo'nah*. See **SPAIN** (Principal Cities).

BARD, one of the poet singers who held so important a place among the ancient Celtic peoples, especially the Welsh and the Irish. All through the Middle Ages, from the sixth century, at least, the bards of Wales and of Ireland had a large part not only in the literary life of their countries, but in their history. They composed verses in honor of the heroic deeds of princes or brave men, and these they sang at court or at special festivals, generally to the accompaniment of the harp. Naturally, they acquired an immense hold on the people, whom they could sway to peace or to war, almost as they chose, and the kings of England therefore looked upon them with great disfavor. In the thirteenth century, Edward I, anxious to make absolute the English rule in Wales, decreed that all the Welsh bards were to be hanged, and it is on this event that Thomas Gray (which see) based his poem, *The Bard*. The Cambrian Society, formed in Wales in 1818, has as its purpose the preservation of the order of the bards established centuries ago.

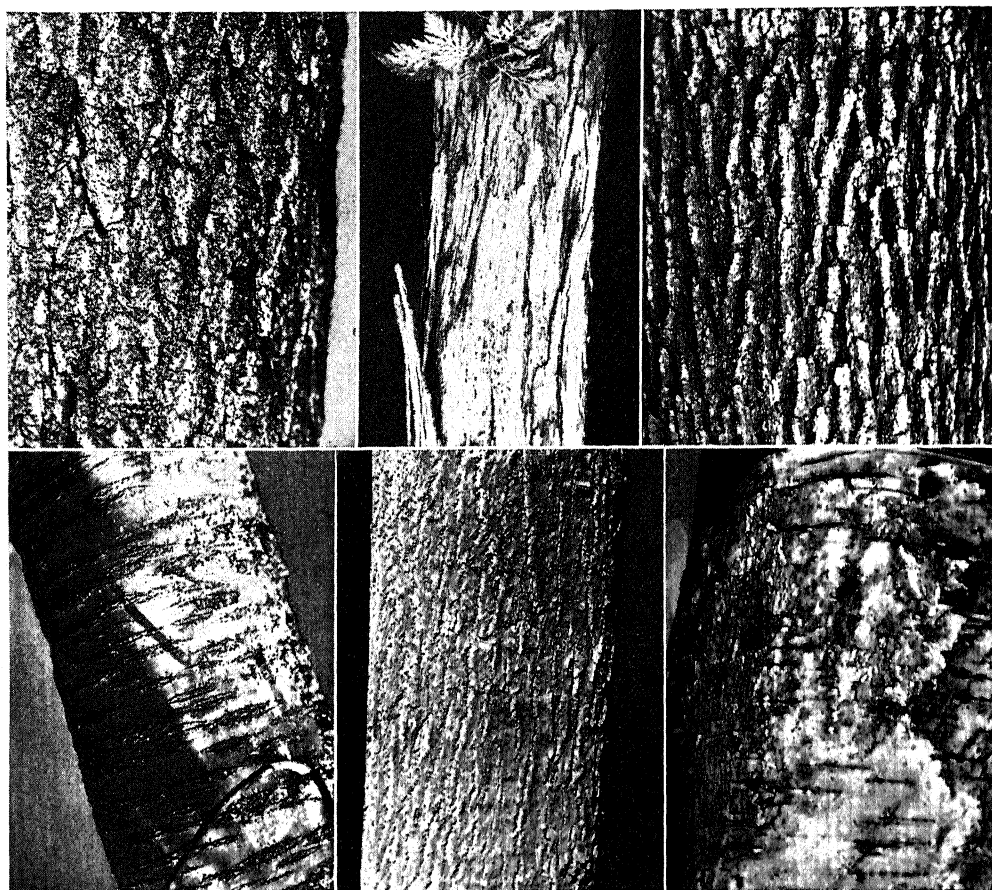
The term is often used poetically to describe any poet, as "Shakespeare, the Bard of Avon." See **MINSTREL**.

BAREBONES PARLIAMENT, *pahr' li ment*, a name scornfully applied to the "Little Parliament" summoned by Cromwell in 1653, one of the most energetic members of which was a Baptist tanner who had the strange name of Praise-God Barebones. This Parliament, which was made up of 140 men of Cromwell's type, sat in session from July 4 to December 12, and, in spite of the ridicule it aroused, passed several wise measures. Among these was a law providing for civil-marriage celebration before a justice of the peace, and for civil-marriage registration. See **PARLIAMENT**; **CROMWELL**, **OLIVER**.

BAR HARBOR, ME., a summer resort on the east shore of Mount Desert, a large island off the coast of Maine. The town is so named because of the sandy bar which connects Mount Desert with a neighboring island. Aside from its location on a beautiful harbor, the town is near many interesting points, including Green Mountain, Eagle Lake, Great and Schooner Heads, Thunder Hole, and Eagle Cliff. It lies forty-six miles southeast of Bangor, Me. Bar Harbor is one of the popular Eastern summer resorts for the person of modest income as well as the millionaire. Lafayette National Park, on Mount Desert Island, was the first national park east of the Mississippi River. The permanent population is not far from 3,650. See **MOUNT DESERT**; **MAINE**.

BARI, *bah' re*. See **ITALY** (The Cities).

BARIUM, *ba' ri um*, a silver-white to yellow metallic element, which is chemically obtained



Photos: Saint Clair

THE BARK OF SIX COMMON TREES

From left to right (at top), black walnut, shagbark hickory, oak; (bottom row), cherry, maple, birch.

from barite, witherite, and some other more complex minerals. The name of the element is from the Greek, and means *heavy*, referring to its density. Its chemical symbol is *Ba* (see CHEMISTRY). Barium was first obtained in 1808 by Davy, the celebrated English chemist. It is pliant and can easily be worked without breaking. It oxidizes readily, decomposes water, and fuses at a low temperature. Barium forms a number of commercially important salts, and barium compounds are used for many purposes. The soluble and carbonate salts are poisonous.

[Witherite is native barium carbonate.]

Barium Sulphate, one of the salts of barium, precipitates as a fine white powder. It is found as the mineral *barite* in many parts of America and Europe, and is used as a common adulterant of ordinary white paint, to increase the weight of paper, in the manufacture of artificial ivory, leather, wall paper, and in the preparation of asbestos cement. Wedgwood employed it in making his jasper ware. See WEDGWOOD WARE.

Barium Nitrate, another of the salts of barium, is used extensively in the manufacture of fireworks, especially "green fires."

Barium Sulphide shines freely in the dark, after having been exposed to a bright light, and on this account is used in making luminous paint.

Barium Chromate is used as a pigment and as an ingredient of matches.

Barium Dioxide, or **Peroxide**, is used in the manufacture of peroxide of hydrogen (which see) and as a bleaching agent in preparing oxygen.

Barium Monoxide, or **Baryta**, a grayish-white poisonous substance, is used in sugar-refining. When added to molasses or sugar solutions, it forms insoluble compounds with certain impurities, which are objectionable as food products.

Barium Hydrate, when mixed with lime, is used to soften water in boilers; it thereby prevents the formation of lime deposits.

T.B.J.

BARK, as distinguished from wood, is the outer covering of stems, branches, trunks, and roots of trees, shrubs, and certain herbaceous plants. Young bark may be composed of three layers.

The *inner bark*, or *fibrous bark*, lying next to the wood, consists in part of bast cells and of sieve tubes, the latter conducting certain organic foods distributed from the leaves. This inner part is also called the *bast*, from the occurrence of certain long, thick-walled cells which in some plants form valuable fibers. The *middle bark*, or *green bark*, is a soft tissue containing the green coloring matter, or chlorophyll, which manufactures starch here in the same way as it does in leaves. This part does not grow much, and in woody stems is often replaced largely by the formation of corky bark, which is generally heavy, rough, or corky, and usually dead. It protects the living inner portions. It does not contain green coloring matter, but gives the stems and twigs their red, purple, brown, or light-gray color.

In some trees, like the birches and the plane tree, the corky bark, after growing and forming new layers for a year or two, splits and separates at a tangent, so that it falls away. Thus, even on old trunks only the inner bark and some cork-forming tissue remain. In general, the inner bark adds new layers each year, from within. The outer bark, not being able to stand the strain of the enlargement due to inner growth, then stretches and tears. That strain, together with the action of sunshine and rain, causes the rough, tattered appearance of old tree trunks.

When a tree is chopped down and cut straight across, a number of distinct rings will be seen in the wood, one within the other. These rings show also what was the total number of layers of the bark (though this number may not still be obvious in the bark), and by counting them one can ascertain the age of the tree (see diagram, under TREE).

Early man used barks for most of the necessities of life. Some were made into clothing and shelter; others furnished fire. Some were made into weapons or canoes; others contributed valuable medicines. Many of these uses have been repeated from generation to generation until the present time.

Some barks are valuable in commerce. Cork consists of the outer layers of the bark of certain oak trees. Tannic acid, the substance of value in tanning leather, is obtained from the bark of hemlock and other trees. Quinine is made from Peruvian bark; cough mixtures, from cherry bark. Bark is the source of the cinnamon of commerce, a popular flavoring; and the bark fibers of hemp, flax, and other plants are made into threads, ropes, mats, and cloths.

Injurious Insects. The rough bark of trees furnishes a home for insects, many of which are injurious to plant life. The insect enemies of the apple, alone, are estimated at over 300. These destructive insects are well represented by the San José scale, which sucks its food from

the inner bark. Elm trees are especially subject to attacks of injurious insect pests. In many localities, folded bands of burlap cloth are fastened around the trunks of these trees as traps for certain species. The larvae, or grubs, crawl into the bands and can in that way be removed and destroyed in large numbers. Another serious pest is the bark beetle, which burrows between the bark and wood or makes a tunnel through the wood. In such receptacles as these the female deposits her eggs. Both mature and young insects are very destructive. B.M.D.

Related Subjects. The reader is referred in these volumes to the following articles:

Apple	Cinnamon	San José Scale
Chlorophyll	Cork	Scale Insect
Cinchona	Insect	Tree

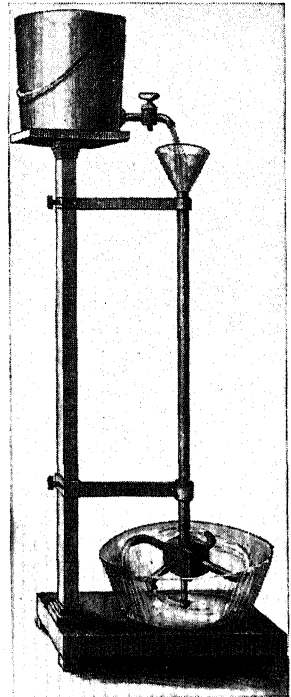
BARK BEETLE. See BARK (Injurious Insects).

BARKER'S MILL, a mechanical device invented near the end of the seventeenth century

by a Dr. Barker, to illustrate the principle that the action of every force is accompanied by an equal reaction in the opposite direction. It consists of a vertical tube, supported by arms which attaches it to a vertical support. On the lower end of the vertical tube is a hollow block, from which short, curved arms extend. The outer openings of these arms all face in the same general direction. The contrivance is mounted on a frame so that it can rotate about the vertical axis.

When water rushes into the vertical tube from the reservoir, the reaction caused by the discharge of the water jet from the orifices in the arms causes each arm to move backward, and thus makes the apparatus revolve. This device is used extensively in automatic lawn sprinklers, automatic sprinkler systems for business buildings, and other forms of apparatus for throwing water.

BARK LOUSE. See SCALE INSECT.



BARKER'S MILL

BARLEY, a grain rated fifth in importance among the world's cereals, being greatly exceeded by oats, wheat, and corn, and slightly by rye. It was known among all ancient peoples; in *Deuteronomy* we read that the Promised Land was a "land of wheat and barley." The sacred books of China mention that barley was cultivated in that country twenty centuries before the beginning of the Christian Era; a species of wild barley is still common in Asia Minor, the modern Turkey and Palestine.

Barley resembles wheat in appearance; it has a spiked head, with kernels arranged along a central stem, and is strongly bearded. It differs from wheat in the height of its plant and in the structure of the head, which produces the well-known two-rowed and six-rowed varieties. It is grown over a wider area than any other grain, for profitable cultivation of its many forms is possible from the equator to 70° north latitude. A very high quality is grown in Canada, where the crop averages about 100,000,000 bushels yearly. Approximately 200,000,000 bushels are raised in a year in the United States, where barley ranks fourth among the grains; in Canada it is third in importance.

Cultivation. Barley is well adapted to a dry, cool climate, and when grown in warm countries

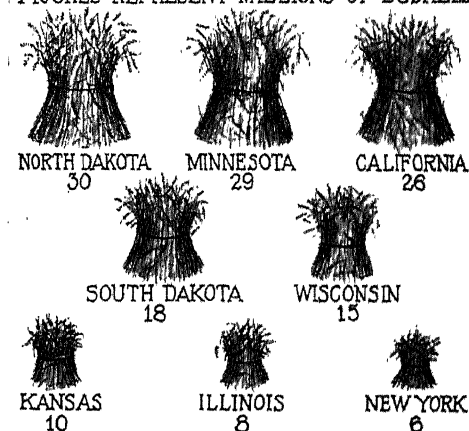
permit growth in both semi-arid districts and humid temperate regions. In the United States, Canada, and most parts of Europe the grain is usually sown in spring, after danger of severe frosts is over. To obtain the best results, the soil on which it is planted should be porous, well drained, and fertile. The land should be thoroughly prepared for the seed by plowing in the season preceding. Fertilizers containing large quantities of nitrogen should not be employed, especially for barley that is to be used for brewing. One to two bushels of seed per acre are sown broadcast, or preferably in drills. If barley follows a hoed crop, like corn, better yields are obtained. Thirty-five or forty bushels per acre is considered a good yield, but sixty bushels or more are obtained under very favorable conditions. The legal weight of barley in Canada and the United States is forty-eight pounds per bushel.

As barley ripens before spring wheat, it is usually harvested just before that crop is cut.



BARLEY

FIGURES REPRESENT MILLIONS OF BUSHELS



PRODUCTION IN THE UNITED STATES

The graphic illustration shows the crop, based on four years' average, in eight leading states.

FIGURES REPRESENT MILLIONS OF BUSHELS



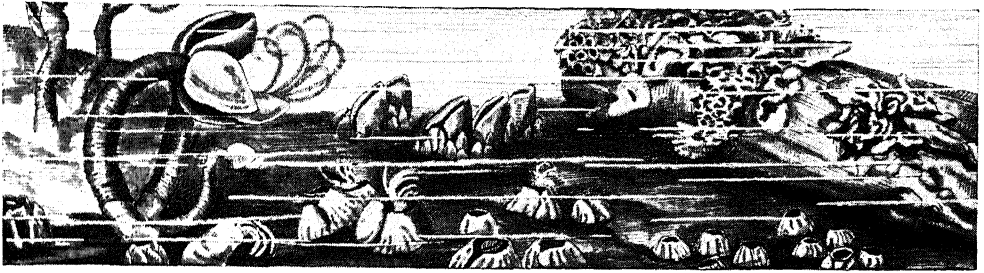
WORLD PRODUCTION

Figures represent five years' average crop.

is a winter crop which matures before the heat of early summer. A variety suited to the region should be selected. The many varieties

The exact time, however, depends upon conditions of soil and climate, and the use to which the grain is to be put. When the grain can be just dented with the finger nail, it is ready for harvesting, unless it is desired for brewing purposes. For that use, it should be dead ripe. As soon as dry enough, the grain should be taken under cover, as rain or dampness discolors it and lessens its value.

Insect Enemies and Diseases. Although much less liable to disease than other cereals, barley is attacked by smut and rust. The Hessian fly also occasionally does damage to barley crops. In America, loose smut is the most serious of barley diseases. It darkens the grain and scatters out in the form of black



VARIOUS FORMS OF BARNACLES

dust. The grain heads are then left empty. To prevent the disease, the seed before planting should be soaked in cold water for four hours, then in water at a temperature of 126° F. for thirteen minutes. The seed should then be sown on clean land. When the grain is attacked by covered smut, the seed should be soaked for ten minutes in a solution of bluestone, one pound to five gallons of water; or formalin, one pint to thirty gallons of water.

Uses. Barley is used as a food for man and beast and for malting purposes. It is rich in starch, but lacks the gluten which is abundant in wheat, which renders it useless for "raised" bread. Although it is probably one of the oldest cereal foods known to man, it has steadily declined in use; however, the coarse black barley bread still serves as food for thousands of peasants in Europe. Pearled barley, which is the polished grain, is used with other ingredients in preparing food for babies and invalids. A drink prepared from it, called barley water, is given to infants with intestinal disorders. Scotch barley is the grain from which the husk has been removed at a mill. Barley is also used for thickening soups. When malted, it is used as a preparation for spirits and beer. It is used in many parts of the United States and Canada as a forage crop, being sowed with peas and vetch.

T.L.L.

Scientific Names. Barley belongs to the grass family, *Gramineae*. The various species are *Hordeum vulgare* (six-row), *H. intermedium* (six-row), *H. distichon* (two-row), and *H. deficiens* (two-row). *Hordeum spontaneum* is a two-row wild barley.

Related Subjects. The reader is referred in these volumes to the following articles:

Brewing	Grains	Rusts
Gluten	Hessian Fly	Smuts

BARLOW'S DISEASE. See **SCURVY**.

BARMECIDE'S, bahr' me sydz, FEAST, a very common phrase which had its origin in the *Arabian Nights* story of the barber's sixth brother, and is used now to describe an imaginary feast. In the story, the barber's poor and hungry brother is invited by a prince of the Barmecide family to a feast. Only empty dishes are put before him, but his host constantly asks him how he likes the food. The jolly beggar praises it all, especially the wine,

which he declares is so heady that it intoxicates him. In this pretended intoxication he boxes the ear of the Barmecide, who laughs heartily at the joke and has a real feast set before him. See **ARABIAN NIGHTS**.

BARMEN. See **GERMANY** (Principal Cities).

BARNABAS, bahr' na bas, a fellow worker with Paul, and, like Paul, ranked as the equal of the Apostles. Barnabas was the family name given to him, his first name being Joseph. Luke makes the name mean *son of consolation*. Barnabas was known for his sweet spirit; "He was a good man, and full of the Holy Ghost and of faith" (*Acts xi, 24*). He accompanied Paul on his first missionary journey, and they labored a year together in Antioch, where the Disciples were first called Christians. Little is known of his later life. See **APOSTLES; PAUL**.

BARNACLE, a salt-water crustacean which has the interesting habit, in the adult form, of becoming attached to the bottoms of wooden ships, wharf piles, rocks, turtles, whales, and other objects under water. Wooden sea vessels regularly enter drydock to have the accumulation of barnacles cleaned from their bottoms. A toxic paint containing chemicals effective against barnacles and like organisms has been devised by the United States Army Chemical Warfare Service, and is expected to prevent these accumulations.

Barnacles have a remarkable life history. The young just hatched from the egg is a small, six-legged, free-swimming animal, with a single eye. It then looks somewhat like a young crayfish. In its next stage, it has six pairs of swimming feet, two compound eyes, and two large feelers, and is still independent and free-swimming. In its third, or adult, stage, it attaches itself by a modification of its antennae to a stone, pile, or ship bottom, loses its eyes and feelers, develops a hard shell, and loses all power of locomotion. Its swimming feet become clinging or grasping organs, which draw water into the shell, and provide the barnacle with the minute forms of plant and animal life on which it feeds.

Barnacles are grouped with crabs, lobsters, shrimps, and other shellfish in the class Crustacea, subkingdom Arthropoda (see **CRUSTACEANS; ARTHROPODA**).

S.H.S.

Barnacle Goose. This name is applied to a wild goose common in Northern Europe, particularly in the North Sea adjacent to the Scandinavian Peninsula. Its forehead and breast are white; the upper body and neck are black. The name is derived from the ancient belief that barnacles produced these geese.

BARNARD, EDWARD EMERSON (1857-1923), an American astronomer, famed for his many original investigations, was born in Nashville, Tenn. He was an eager student of astronomy in his boyhood, and during his college career at Vanderbilt University, where he was graduated in 1887, he was supervisor of the observatory. After leaving college, he was the astronomer of the Lick Observatory, in California, until 1895, and from the latter date until his death he was the astronomer of the Yerkes Observatory at Williams Bay, Wis., and professor of practical astronomy at the University of Chicago. Barnard is credited with the discovery of the fifth satellite of Jupiter (1892), and of sixteen comets, and he proved that

the starless spaces in the Milky Way are occupied by dark nebulae. His researches and discoveries won him many prizes and medals from astronomical societies in various parts of the world. He died at the age of sixty-six. See **ASTRONOMY; NEBULA.**

BARNARD, FREDERICK AUGUSTUS PORTER. See **BARNARD COLLEGE**, subhead.

BARNARD, GEORGE GREY (1863-), one of the most distinguished of American sculptors, whose reputation is even greater abroad than at home. He did not become a highly popular artist, for his work is so original as well as idealistic that it does not always make an immediate appeal. Some of his productions, as the well-known *Two Natures*, marvelously executed as they are and from that standpoint entirely satisfying, are so mysterious in their symbolism that they do not disclose their meaning to the closest observer. In this great work, which is in the Metropolitan Museum

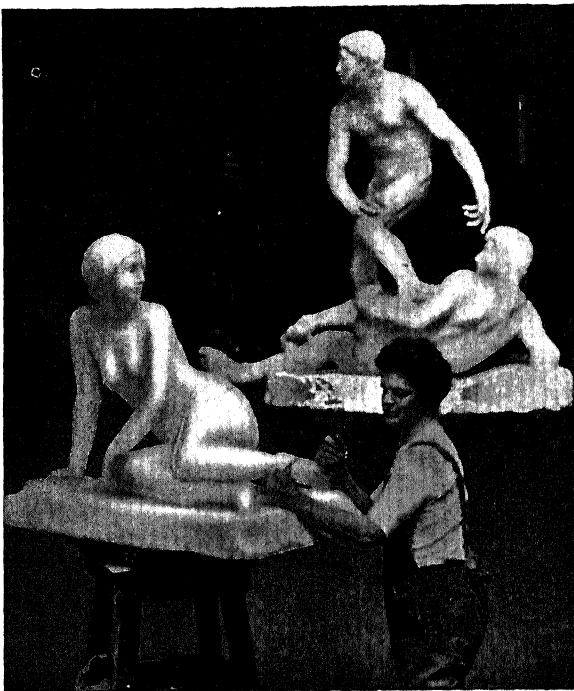
of Art, New York, and which the artist calls in full, *I Feel Two Natures Struggling Within Me*, the struggle is indeed shown, and the victor is clearly evident, but nothing in face or figure shows which nature—whether wrong or right—is triumphant. It is the sense of power, of irresistible force behind the titanic figures which, even more than the superb modeling, makes the work great. Others of Barnard's works

are a great group, *Brotherly Love*, for a tomb in Norway; *The Boy; Maidenhood; The Urn of Life*, which includes nineteen figures in marble; the *God Pan*, in bronze, on the campus of Columbia University; and sculptures for the state capitol of Pennsylvania.

Barnard was born at Bellefonte, Pa. He studied at the Art Institute, Chicago, and the School of Fine Arts in Paris; before his return to the United States, in 1895, he had won a very favorable reputation by sculptures exhibited in the Paris Salon. He received gold medals at the Paris Exposition of 1900 and at the Pan-

American Exposition of 1901, and was professor of sculpture in the Art Students' League. Barnard built in upper New York a museum called "The Cloisters," plain and barnlike without, but within a fit setting for one of the finest collections of sculptures in the United States. These, which are in large part of the French Gothic period, he discovered during his stay in France, excavating many of them himself.

BARNARD, HENRY (1811-1900), the first United States Commissioner of Education and the organizer of the Bureau of Education. He was born in Hartford, Conn., was graduated at Yale, and in 1835 began the practice of law. While a member of the Connecticut legislature, he became interested in school reform, and his work along this line attracted such attention that he was asked to examine the public schools of Rhode Island. After completely reorganizing the school system of that state, he returned



GEORGE GREY BARNARD AT WORK

In the background is his famous *I Feel Two Natures Struggling Within Me*.

to Connecticut to become superintendent of the state schools and principal of the state normal school at New Britain.

From 1857 to 1859 he was president of the University of Wisconsin, and in 1865 became the head of Saint John's College, Annapolis, leaving the latter position in two years to become the first Commissioner of Education of the United States. Besides laying the foundation for the Bureau of Education, he issued a number of educational circulars of far-reaching influence. In some of these were recommendations which later were made the foundations of the public-school system of the several states as it exists to-day.

BARNARD COLLEGE, a department of Columbia University, New York City, constituting the university's undergraduate school for women. President Barnard of Columbia, for whom the college was named, tried in vain to have Columbia made a coeducational institution; the new college was established to supply the need of higher education for women. There were no funds and no promise of them, but the hopeful founders felt certain that these would come when the school had proved its worthiness, and their faith and patience were justified. Barnard College has approximately 900 students, to whom degrees are granted in the name of Columbia University. The president of Columbia is president *ex officio* of Barnard, but the latter has its own board of trustees and its own instructors. See COLUMBIA UNIVERSITY.

Frederick Augustus Porter Barnard (1809-1889), founder of the above-named college, was born in Massachusetts and educated at Yale. He began his career as a teacher of the deaf and dumb, but in 1848 became professor of natural philosophy and mathematics in the University of Alabama. In 1856 he was elected president of the University of Mississippi, and in 1864 became president of Columbia College (now Columbia University), a position he held for twenty-four years. At his death, he left most of his property to Columbia.

His Books. He edited, in 1872, Johnson's *Universal Cyclopedia*, and was the author of *A Treatise on Arithmetic*, *Letters on Collegiate Government*, and *Recent Progress in Science*.

BARNBURNERS. In 1844 the Democratic party of the United States split into two bitterly opposing factions. One wing, led by Martin Van Buren, was given the name Barnburners, from a story current at the time about a farmer who destroyed his barn by fire to free it from rats. The opponents of Van Buren charged that he was willing to sacrifice his party if such an act would destroy the influence of political enemies. See POLITICAL PARTIES.

BARNES FOUNDATION. See EDUCATIONAL FOUNDATIONS.

BARNUM, PHINEAS TAYLOR (1810-1891), the most noted showman America has produced, who made several fortunes through his belief that "the American people like to be

humbugged." He was not dishonest; he frankly admitted the character of many things he exhibited, but he had early learned that an air of mystery thrown around an exhibit increased the desire to view it. He was the son of a tavern-keeper of Bethel, Conn., and from the time he was thirteen, worked for his living. At the age of eighteen, he went into the lottery business; when he was nineteen he married secretly.

In 1834, Barnum removed to New York, where he entered upon his first venture as a showman, buying Joice Heth, the reputed colored nurse of General Washington, and exhibiting her with considerable profit. After 1839, he was reduced to poverty, but in 1841 he bought Scudder's American Museum in New York, through which he became at once prosperous by exhibiting various fraudulent freaks and curios, and also a noted dwarf (Charles S. Stratton of Bridgeport), whom he styled General Tom Thumb. In 1847 he offered Jenny Lind \$1,000 a night to sing for 150 nights, and received \$700,000—the concert tickets often being sold at auction, in one case as high as \$650 for a single ticket. In presenting this marvelous singer to American audiences, he performed a distinct service to music lovers (see LIND, JENNY).

Soon, however, he was again bankrupt, but immediately entered upon new enterprises and made another fortune. His greatest venture was his traveling museum, menagerie, and circus, known as the "Greatest Show on Earth," which required 500 men and horses and 100 railroad cars to transport it. He paid \$10,000 to the London Zoological Society for the huge elephant, "Jumbo." This traveling circus was the forerunner of the later great traveling companies of like character. Barnum published several books, including an autobiography, which tells frankly of many of the audacious frauds he perpetrated.

BARODA, *ba ro' dah*. See INDIA (Cities).

BAROMETER, *ba rom' e tur*, an instrument for recording atmospheric pressure, used chiefly in forecasting weather and in measuring heights of mountains (see AIR). If you take a glass tube somewhat over thirty inches long and closed at one end, fill it with mercury, put your thumb over the open end, as shown in Fig. 1 *a*, and insert this end in a cup of mercury, as in Fig. 1 *b*, the liquid in the tube will fall until its



Photo: Brown Bros.
PHINEAS T. BARNUM

top is only about thirty inches above the surface of the liquid in the cup. If you were to admit air to the vacuum above the mercury

by breaking open the top of the tube, the mercury would fall until it reached the same level in the tube as in the cup. So long as the tube remains air-tight there is no weight pressing on the mercury in it, and the fluid is thrust upward by that in the cup, which is under pressure from the atmosphere. This is the experiment which Torricelli, a pupil of Galileo, made in 1643; from it he learned that the weight of all the air above any point is equal to the weight of a column of mercury about thirty inches high.

About the same time, Otto von Guericke, who was elected burgomaster of Magdeburg in 1646, became interested in the investigations concerning a vacuum, and he followed the experiments of Galileo and his pupil with the invention of a water barometer. This was a tube over thirty-four feet long, with a closed glass section at the top, the remainder of the device being brass. The lower end was dipped in water, whose surface alternately rose and fell as the weather changed. The tube was attached to the side of the house, and passers-by could see, through the glass at the top, the wooden figure of a little man who floated high when the weather was good, and sank when it was stormy.

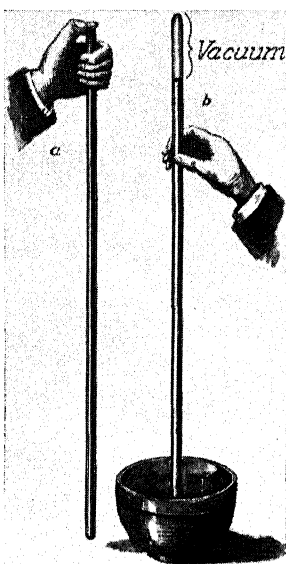
Measuring Altitude with a Barometer. Not long after Torricelli's experiment was first performed, scientists realized that if it were truly the weight of the air which supported the fluid in the tube, the mercury would fall farther upon a mountain top, where there was less air above it. Pascal proved this to be true, and the mercury tube was given the name *barometer*, which means *pressure-measure*. Since then, barometers of all sorts have been helpful in measuring heights, and when you read that an airplane pilot has reached a height of 30,000

feet, you may know that this figure was learned from his barometer.

The Barometer and the Weather. The barometer has made possible the modern science of weather forecasting. When the mercury falls rapidly, a storm is quite sure to follow, while a "rising barometer" foretells fair weather. And, by drawing upon a map *isobars*, or lines of equal atmospheric pressure (*iso* means *equal*, and *bar* means *pressure*), the probable course of winds and storms can be learned. More about this will be found in the article WEATHER BUREAU.

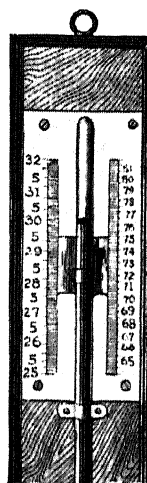
Persons with rheumatism and similar ailments often say that their aches increase on the approach of bad weather. What actually happens is that the decreased atmospheric pressure recorded by the barometer causes the air in the cells of the body to exert an increased outward pressure. This is felt by the sensitive tissue of rheumatic persons.

Different Kinds of Barometers. The barometer in Fig. 2 is exactly the same in its principle as the tube and cup in Fig. 1, but is fitted with appliances to assist accurate reading. By turning the thumbscrew at the lower end, the bottom of the mercury chamber can be raised or lowered so that the surface of the fluid in the reservoir will be level with the zero mark of the scale. Such an adjustment is necessary because this surface rises whenever the mercury in the tube falls, and falls when the latter rises.

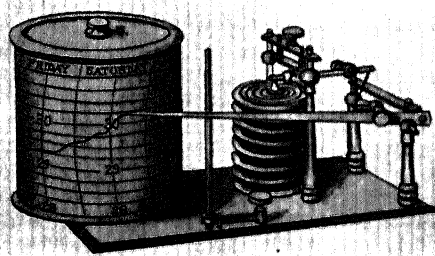


PRINCIPLE OF THE BAROMETER

(a) Glass tube filled with mercury, ready to insert in vessel. (b) Tube inverted. Mercury stands in tube at height of thirty inches (at sea level), under normal atmospheric conditions. This is known as Torricelli's experiment. (Fig. 1)



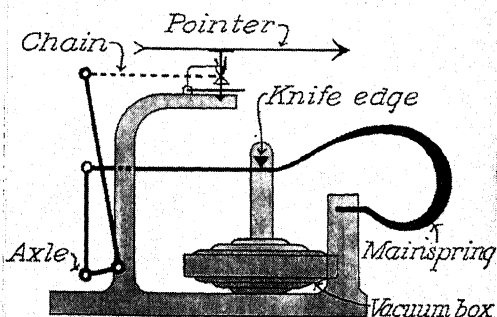
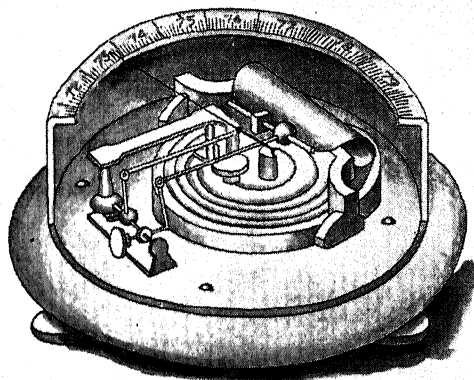
MERCURY BAROMETER (Fig. 2)



THE BAROGRAPH

This is a self-recording barometer, on which the changes in the reading are marked in ink day by day. One cylinder holds a record for a week.

Barometers can be made without mercury; Pascal filled one with wine, but it had to be forty-six feet long, because wine has little



MECHANISM OF THE ANEROID BAROMETER (Fig. 3.)

weight. Barometers built without any liquid at all are called *aneroid*, which means *dry*. They operate by recording the pressure on an air-tight box, from which a part of the air has been exhausted. They are not as accurate as mercury instruments, but indicate much slighter changes in the atmosphere. An aneroid barometer is shown in Fig. 3. The barograph, another form, is described in the illustration on page 636.

Problems. 1. The density of mercury is 13.596 grams per cubic centimeter, or 0.49 pound per cubic inch. Calculate the atmospheric pressure at sea level in both systems.

SOLUTION

Under standard conditions the height of the column of mercury in the barometer is 76 centimeters, or 30 inches, and the column is 1 square centimeter or 1 square inch in cross section.

Pressure of atmosphere is therefore 76×13.596 or 1033.3, number of grams per square centimeter; or 30×0.49 or 14.7, number of pounds per square inch.

2. Atmospheric pressure decreases about 0.1 inch of mercury for every 90 feet of ascent, for places not far above sea level. What is the altitude of a hill if the barometer reads 30 inches at the bottom and 29.1 inches at the top?

SOLUTION

$30 - 29.1 = 0.9$, change of pressure in inches of mercury. $\frac{0.9}{0.1} \times 90 = 810$, altitude of hill in feet.

3. At what altitude is the atmospheric pressure 14 pounds per square inch?

SOLUTION

Since pressure equals height of mercury \times density of mercury, in this case $14 = h \times 0.49$, and $h = \frac{14}{0.49} = 28.57$. The barometer reading is therefore 28.57 inches.

30 (normal reading) $- 28.57 = 1.43$, change in barometer reading. Since 0.1 inch denotes an ascent of 90 feet, the total height of the elevation is $\frac{1.43}{0.1} \times 90$ feet, or 1,287 feet.

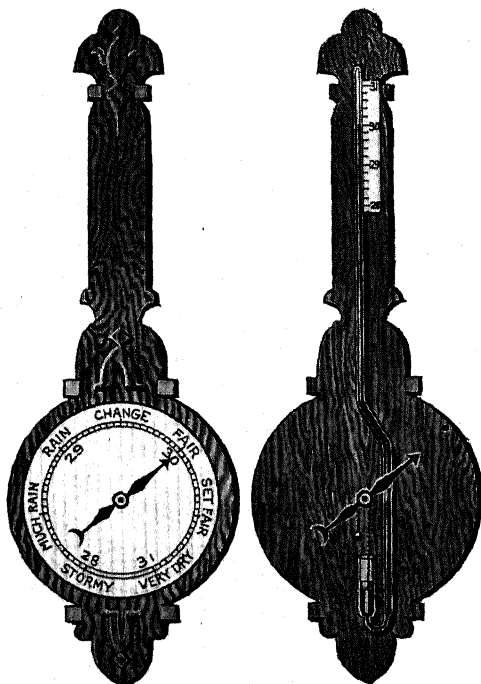
Related Subjects. The reader is referred in these volumes to the following articles:

Air
Isobars

Pascal, Blaise
Torricelli

Weather Bureau

BARON, *bair' un*, the title held by noblemen in the lowest rank of the British peerage. This rank was introduced into England at the time of the Norman Conquest (1066), when it was bestowed on those who received grants of land



ANOTHER STANDARD FORM

from the king in return for military service. The barons eventually became divided into "greater" and "lesser" barons, according to the

amount of land held. They gradually assumed considerable power; their grants of land were considered hereditary, and were handed down from father to son, thus establishing the feudal aristocracy. The greater barons became earls or dukes, with the lesser barons as their retainers. The title of baron is now conferred by the king, usually for distinguished service or in recognition of distinction in art or letters; the holder is addressed as "Lord," and is entitled to a seat in the House of Lords.

Baronet. A title taking rank between that of baron and knight is that of *baronet*. King James I, when sorely in need of money, introduced this title to be sold to a limited number of persons. The king's need of money was such, however, that the limit was very elastic. The title is now conferred by the king on those whom he wishes to honor. It is hereditary, but does not entitle the holder to a seat in the House of Lords. A baronet is addressed as "Sir."

Related Subjects. The reader is referred to the following articles in these volumes:

Duke	Marquis	Titles of Honor
Earl	Prince	Viscount

BARR, AMELIA EDITH HUDDLESTON (1831-1919), a popular American novelist whose reputation was not established until she was past fifty years of age, and who thereafter wrote about sixty books. She was born in England, was educated in that country and in Scotland, and she emigrated to the United States in 1854, four years after her marriage. In 1867, while living in Galveston, Tex., she lost her husband and three sons in a yellow-fever epidemic, and it was the urgent need of earning a living for herself and three daughters that caused her to turn to writing as a profession.

She removed to New York City in 1869, and for years toiled away on miscellaneous work—advertisements, circulars, short articles, verses, etc.—learning to write by writing, and seeing the end of her apprenticeship in 1884, when a leading publishing firm accepted her *Jan Vedder's Wife*, the book that secured for her the place she now holds among American writers.

Summary of Her Work. *Jan Vedder's Wife*, one of Mrs. Barr's most characteristic tales, a vigorous story of life in the Shetland Islands, has been translated into many different languages. Others of her novels have an historic background, as *The Border Shepherdess*, the scenes of which are laid in the borderland between England and Scotland; *The Bow of Orange Ribbon*, a tale of New York during the period of Dutch supremacy; and *Friend Olivia*, a story of the English Commonwealth. Among later novels are *The Hands of Compulsion*, *The House on Cherry Street*, and *Sheila Vedder*. She wrote an interesting autobiography, *All the Days of My Life*.

BARR, ROBERT (1850-1912), a British novelist whose vigorous and animated stories have

been widely read. He found much of the material for his scenes and characters in the United States and in Canada. He was born in Glasgow, Scotland, educated in Toronto, Canada, and later became head master of the Central School of Windsor, Ont. In 1876, he was on the staff of the *Detroit Free Press*, writing under the name of "Luke Sharp"; five years later he was sent to London to establish an English weekly edition of that paper. During his residence in England, he became associated with Jerome K. Jerome (which see), in the founding of the *Idler*, a monthly magazine. Barr's first novel, *In a Steamer Chair*, was published about the same time.

Principal Writings. His narratives are full of life and action. They show that his first concern is to tell the story, while the portrayal and development of character is a secondary matter. One of his most popular novels, *In the Midst of Alarms*, is a story of the Fenian raid in Canada in 1866. Other well-known titles are *Countess Tekla*, *The Face and the Mask*, *A Prince of Good Fellows*, and *The Palace of Logs*. *The Unchanging East* is a series of travel sketches.

BARRACK EMPERORS. See **ROME** (The Decline of the Empire).

BARRACUDA, *bair a koo' dah*, a sea fish resembling the pike in shape and in fierceness of disposition, but in its relationships allied to the gray mullets (see **MULLET**). There are a number of species. The great barracuda of the West Indies and Florida coast waters is a strong, ferocious fish, from six to eight feet in length. It not only preys on smaller fish, but attacks human swimmers; some serious wounds credited to sharks have been inflicted by this fighting creature. The flesh of the great barracuda is suspected of being unwholesome, but this reputation is not wholly deserved. Ordinarily, it can be eaten safely, and it has a good flavor. On the Southern California coast is found the *silver barracuda*, a species three to five feet long. It is valued as a food fish, as its flesh is very palatable when salted and dried. L.H.

Scientific Names. Barracudas belong to the family *Sphyrenidae*. The great barracuda is *Sphyrna barracuda*; the silver is *S. argentea*.

BARRANQUILLA, *bahr rah'n keel' yah*, COLOMBIA. See **COLOMBIA**.

BARRAS, *ba rah'*, PAUL FRANÇOIS JEAN NICHOLAS, Count de (1775-1829), a French statesman who bore a prominent part in the French Revolution of 1789. Though descended from a noble family, he eagerly took up the cause of the Revolutionists, joined the mob that stormed the famous old prison known as the Bastille, and also took part in the attack on the royal palace of the Tuileries. As a member of the National Convention, he voted for the death of King Louis XVI in 1793.

For some time thereafter, Barras exercised

great power. He became president of the Convention, helped to bring about the overthrow of Robespierre and other leaders in the Reign of Terror, and in 1795 was nominated as one of the five members of the Directory. To him Napoleon owed his appointment as commander in chief of the army in Italy. While the Directory was in control of affairs, the authority of Barras was unquestioned, but when it was replaced by the Consulate, in 1799, he was forced to yield his power to Napoleon, and to leave Paris. He afterward resided abroad, constantly watched by the police, and returned to Paris only after the Bourbons were restored. His memoirs are of great importance as a source of information concerning the Revolution.

Related Subjects. The reader is referred in these volumes to the following articles:

Bastille
Bonaparte, Napoleon
Directory

French Revolution
Robespierre
Tulleries

BARRE, *bair' e*, VT. See VERMONT (back of map).

BARREL, a vessel made of pieces of wood called *staves*, bound together by metal or wooden hoops. The staves are wider in the middle than at the ends, causing the barrel to bulge in the middle. This shape has been found most suitable, because it gives increased strength, though there is a waste of space in shipment. The top and bottom, called *heads*, are formed by circular boards which fit into grooves near the ends of the staves. When used for liquids, a hole is bored in one end, through which the barrel is filled and emptied; this hole is called a *bung*, a name also given to the cork or plug used to fill the hole to preserve the contents. For many centuries, barrels were made entirely by hand, by skilled workmen called *coopers*, but now labor-saving machinery is employed, and cooperage, as a trade, is no longer a profitable employment, except in remote country districts.

The barrel as a measure has many different meanings. In the United States, a standard measurement for apple barrels was established for the first time in 1912. The law provides for a barrel with 21½-inch staves, 17½-inch heads, and the material must not be more than ¾ of an inch in thickness. The capacity must be 7,056 cubic inches. A barrel having that capacity, whether its measurements agree with those stated or not, may be considered as standard. The barrel for liquids must contain 31½ gallons, each of 231 cubic inches.

In England, a barrel of wine contains 31½ gallons; a barrel of beer, 36½ gallons—though for convenience beer is usually sold in 4½, 9, and 18-gallon kegs. Canada adheres to what is called the imperial standard; a wine barrel contains 26½ gallons; an ale barrel, 31½; a beer barrel, 36½ gallons.

BARREL ORGAN. See HAND ORGAN.

BARRETT, LAWRENCE (1831-1891), an American actor, born in Paterson, N. J., whose best work was done during a memorable association with the famous Edwin Booth. He made his first appearance on the stage at Detroit, Mich., in 1853, as Murad, in the drama, *The French Spy*. In 1861, at the beginning of the War of Secession, he served for a time as captain of a company of Massachusetts infantry. After his retirement from the army, he returned to the stage, taking important rôles in Edwin Booth's company, and varying his work with the management of theaters in New Orleans and San Francisco.

Barrett acted successfully in England during a short visit there in 1884. Three years later he became again associated with Booth, and remained with him until his death, playing Othello to Booth's Iago, and Cassius to his Brutus, and interpreting many other Shakespearean rôles with distinction. Though he had not the genius of Booth, nevertheless his acting had high intellectual quality. His *Life of Edwin Forrest* and a sketch of Edwin Booth, written by him, are admirable.

BARRIE, *bair' ie*, SIR JAMES MATTHEW (1860-), a Scotch dramatist and story-writer, of quaint and delicate humor, tender pathos, and poetic fancy, whose fairy play, *Peter Pan*, is undoubtedly one of the best-loved dramas of all time. He was born in Kirriemuir, Scotland, and soon after his graduation from Edinburgh University, in 1882, began to find a loyal reading public for his sketches and stories. In 1885 he removed to London, and by 1900 had become one of the most popular writers of his time. King George V made him a baronet in 1913.



J. M. BARRIE

Summary of His Literary Work. *Auld Licht Idylls* and *A Window in Thrums*, picturing the everyday life of the Scotch people, with their quaint speech and customs, are classics among books of their kind. *The Little Minister* established his fame; *Sentimental Tommy* and *Tommy and Grizel* revealed his appreciation of romance. His love for child life comes out clearly in *The Little White Bird*, a book of special interest because it introduces Peter Pan, the boy who would not grow up, and whose story was expanded into the play that makes grown-up people children again.

Barrie's plays have the individual touch that makes them like no others, and they are as charming to read as to see on the stage. Many of them have become familiar to American play-goers through the sympha-

thetic interpretation of Miss Maude Adams, whose Lady Babbie of *The Little Minister*, Maggie of *What Every Woman Knows*, Leonora of *The Legend of Leonora*, and, above all, her *Peter Pan*, will not soon be forgotten. Other plays include *Alice-Sit-by-the-Fire*, *The Will*, *Old Lady Shows Her Medals*, *A Kiss for Cinderella*, *Dear Brutus*, and *Mary Rose*. Several of the stories and plays have been adapted for moving-picture presentation, with charming effect.

Peter Pan. The moment when the fate of fairy Tinker Bell is decided by Peter Pan's anxious appeal to the audience, which for an hour passionately does



Photo: O R O G

"THE BOY WHO NEVER GREW UP"

This statue of Peter Pan is beloved alike by children and adults. It is in bronze, with animals, birds, and children peeping out in groups at the boy's feet.

believe in fairies—and says so—that moment is not forgotten by those who have been part of the audience of this delightful fantasy, whether played on the stage or in moving pictures. Equally delightful are memories of Wendy Darling, her brothers, their dog-nurse, and the boys of Never-Never Land, but especially of Peter Pan himself, elusive, faunlike, and defiantly refusing to become a "grown-up." So popular did the play become from its first performance in 1904 that it is given each year in London, at Christmas time; a statue of Peter Pan stands in Kensington Gardens. In the United States, Maude Adams created the part of Peter Pan on the stage; when it was made into a moving picture, some years later, Peter Pan was played by Betty Bronson.

BARRIER REEF. See AUSTRALIA (Physical Features).

BARRISTER, in England, Ireland, and some of the other British lands, the highest grade among lawyers, the word being derived from the word *bar*. A barrister is literally one who appears in the law courts and argues cases before the bar. This is his chief business, and in the higher courts only a barrister may appear for the client. A barrister who has been honored with the rank of *King's Counsel* (K. C.) takes precedence over ordinary practitioners, who are called *utter*, or *outer*, barristers. A King's Counsel may stand within the bar of the court, but an outer barrister must stand outside. To become a barrister, a man must be a member of one of the Inns of Court (see below), and must then pass an examination before he is "called" to the bar.

In Canada, there is no formal distinction between barrister, solicitor, advocate, attorney, and other titles, but the honor of "K. C." is frequently given to Canadians. It is common for a lawyer to style himself "Barrister and Solicitor" in all the provinces except Quebec, where "Advocate" is preferred. The different functions of barrister and solicitor, however, are understood; though a man calls himself both, when he acts as legal adviser he is acting as solicitor. In the United States, the word barrister is now seldom, if ever, used. In its place the phrase, "Attorney and Counsellor-at-Law," is common.

Inns of Court, four legal societies in London which possess the privilege of admitting persons to the practice of law. Their origin can be traced back to medieval times.

BARRON, JAMES (1760-1851), a commodore in the United States navy who came prominently into public notice during the critical period before the War of 1812. In 1807, while commanding the *Chesapeake*, he was challenged by the captain of the British frigate *Leopard*, who demanded the surrender of several American sailors accused of being British deserters (see WAR OF 1812). Commodore Barron's refusal to obey this demand was met by a broadside from the *Leopard's* guns, which killed three and wounded eighteen of the *Chesapeake's* crew. Barron thereupon hauled down the American flag and surrendered the suspected men, for which he was court-martialed and suspended from rank and pay for five years, then placed on shore duty. In 1820 he killed Commodore Decatur in a duel, in which he himself was seriously wounded (see DECATUR, STEPHEN).

BARRY, JOHN (1745-1803), called the "father of the American navy," was a native of Ireland, but after 1760 was a citizen of the American colonies and of the new United States. In Philadelphia, before the Revolutionary War, he acquired considerable wealth as master of a

sailing vessel. When war began, he entered the service of the colonies as master of the brig *Lexington*, and soon he captured the British *Edward*, the first vessel ever taken by an American commissioned naval officer. He followed this successful exploit with numerous others, all of which added to his renown. After the war, he was tireless in his efforts to effect the organization of a permanent American navy, and in 1794 became its ranking officer, with the title of commodore. His services were of great value in helping the United States to achieve independence.

BARRYMORE, the name of a family of actors who represent the highest traditions of their profession. They are the children of Maurice Barrymore and Georgie Drew-Barrymore. John Drew was their uncle. See **DREW, JOHN**.

Ethel Barrymore (1879-), one of the foremost American actresses, was born in Philadelphia. With her first stage appearance, in 1895, she was successful. In 1897 she was engaged by Sir Henry Irving, the English actor, and as a member of his company appeared in many important parts. In 1900 she starred in *Captain Jinks*, and thereafter had ample opportunity to reveal the diversity of her talent. Miss Barrymore's great beauty and high talents have made her an outstanding personality of the American stage. She was divorced from Russell G. Colt in 1923.

Miss Barrymore had popular rôles in *A Doll's House*, *Alice-Sit-by-the-Fire*, *Cousin Kate*, *Mid-Channel*, *The Shadow*, *Our Mrs. McChesney*, *The Lady of the Camelias*, *Deçlassé*, *Romeo and Juliet*, *The Laughing Lady*, *The Second Mrs. Tanqueray*, and other lesser plays, and she also toured in several of Barrie's comedies.

John Barrymore (1882-) began his professional career in Chicago in 1903. He creditably upheld his family's reputation and proved his versatility in varied rôles, both on the stage and on the screen.

He has had leading parts in *The Boys of Company B*, *Miss Civilization*, *A Stubborn Cinderella*, *The Por-*

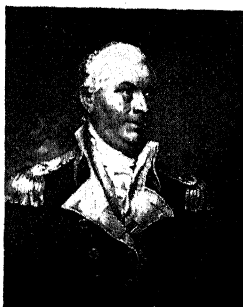


Photo: Brown Bros.
JOHN BARRY



tune Hunter, and *Peter Ibbetson*, and has starred in more serious rôles, notably in *Justice* and Shakespeare's *Richard III* and *Hamlet*, thus fulfilling an ambition he long cherished. His most notable success in moving pictures was the leading rôle in *Beau Brummell*. In 1929 he married Dolores Costello.

Lionel Barrymore (1878-), brother of Ethel and John Barrymore, became well known both on the stage and in moving pictures. He appeared for the first time in 1893 in *The Rivals*, in which Mrs. John Drew, Sr., was the star.

He has played in *Arizona*, *The Second in Command*, *The Best of Friends*, *The Other Girl*, *Barrie's Pantaloon*, *The Jest*, *The Claw*, and *Laugh, Clown, Laugh*.

BARTER, the exchange of one article for another without the use of money. It means trading one thing for another; if money is the medium of exchange, the transaction is not barter, but *sale*.

Among uncivilized people or in places remote from active commerce, barter has always been carried on. Natives of Africa and the islands of the South Seas, following the custom of people of primitive times, are readily induced to

barter such things as they possess in exchange for weapons, ornaments, cloth, or food-stuffs, which have definite value to them. When money is shown to them, it has no specific meaning, for they cannot relate it to their experiences, but they do sense at once the value, to them, of a piece of merchandise. See **COMMERCE**.

BARTHELMESS,

RICHARD. See **MOVING**

PICTURES (list of players).

BARTHOLDI, *bahr tol de'*, **FREDERICK AUGUSTE**, a great French sculptor, whose life story is summarized under the title **LIBERTY, STATUE OF**.

BARTHOLOMEW. See **APOSTLES**.

BARTHOLOMEW'S DAY, **SAINT**. See **SAINT BARTHOLOMEW'S DAY, MASSACRE OF**.

BARTLESVILLE, OKLA. See **OKLAHOMA** (back of map).

BARTLETT, PAUL WAYLAND (1865-1925), an American sculptor, who first exhibited his work in the Paris Salon at the remarkably early age of fourteen. He was born at

New Haven, Conn., and grew up in an artistic atmosphere, his father having been a sculptor and art critic. After studying in Boston, he went to Paris, where in 1880 he entered the School of Fine Arts. Seven years later he at-



Photo: U & U
THE BARRYMORES
Lionel, Ethel, and John.

tracted wide attention by his *Bear Tamer*, shown at the Salon. His *Ghost Dancer*, first viewed at the World's Columbian Exposition, showed astonishing skill. Later notable works include a statue of General Joseph Warren, in Boston; an equestrian statue of General McClellan, and an equestrian statue of Lafayette, in Paris, presented to France by the school children of the United States. For the Congressional Library at Washington, he produced a statue of Columbus and one of Michelangelo, and for the central entrance of the New York Public Library, six great figures representing Fable, the Drama, Poetry, Religion, History, and Philosophy. Chosen to adorn with sculptures the pediment of the east portico of the Capitol at Washington, he designed for the purpose a group of figures representing the democracy of the United States as shown in its working people. Critics rank the production very high among works of this character.



Photo: U & U

SCULPTOR BARTLETT

BARTOLOMMEO, *bahr toh lom meh' o*, FRA (1475-1517), the name assumed by BACCIO DELLA PORTA, one of the principal painters of the Florentine school during the Italian Renaissance. He was born at Florence, Italy, and early came under the influence of the great Leonardo da Vinci. While engaged in painting some pictures for the convent of the Dominican friars, he became a fervent admirer and follower of Savonarola, and was so grieved by the untimely death of the great leader that he joined the Dominican Order, and gave up painting for several years.

Persuaded at length by his superior to resume his work, he made the acquaintance of Raphael, who taught him the rules of perspective. Later, while on a visit to Rome, he saw the beautiful frescoes of Michelangelo in the Sistine Chapel, which worked a transformation in his art.

Fra Bartolommeo's paintings are remarkable for their arrangement of light and shadow and rich and delicate coloring. He excelled, however, in the handling of drapery, and was the first to use the jointed model known as a lay figure.

His Paintings. His best-known canvases are *Saint Mark*, his masterpiece, in the Pitti Palace at Florence; *Saint Sebastian* and *Marriage of Saint Catharine*, in the Louvre, Paris; and a portrait of Savonarola.

[See the story of each artist named, in its place in these volumes.]

BARTON, CLARA (1821-1912), one of the most famous women America has produced, who devoted her life to the good of humanity, and whose most enduring achievement was the founding of the United States branch of the Red Cross Society. She was born in Oxford, Mass., and educated in Clinton, N. Y. In middle life, she became deeply interested in soldiers' relief work during the War of Secession. Among other activities of that period, she named and marked the graves of over 12,000 soldiers in the Andersonville (Ga.) National Cemetery.

In 1869, Miss Barton went to Switzerland, where she came in touch with the members of the International Committee of the Red Cross. Encouraged by them, and inspired by the work of the Red Cross during the Franco-German War, she returned to America in 1873 and began at once the organization of an American branch of the society. She became its first president, and held that position until 1904.

To Miss Barton is due the honor of having originated the clause in the Red Cross constitution whereby the society may extend relief in calamities other than war, such as famines, floods, earthquakes, and pestilence. She took charge of the relief work in the yellow-fever outbreak in Florida (1887), the Johnstown flood (1889), the Russian and Armenian famines of 1891 and 1896, in the Spanish-American and Boer wars, and in the Galveston flood of 1900. The German emperor recognized her services by decorating her with the Iron Cross of Germany, at that time a coveted decoration. See RED CROSS SOCIETIES.



MISS CLARA BARTON

Revered founder of the Red Cross Society in America.

BARYSPHERE, *bar' i sfer*. See GEOLOGY (Structure of the Earth); EARTH (Parts of the Earth).

BASALT, *bas awlt'*, the name applied to certain dark-colored, heavy, fine-grained rocks formed by volcanic action (see IGNEOUS ROCKS). They are crystalline in structure, but the crystals are usually too minute to be seen with the naked eye. In many cases the rock is vesicular (contains small cavities), and the small cavities may be filled with secondary minerals, such as calcite. The essential minerals are soda-lime feldspar and pyroxene; magnetite is usually present in small amount, and olivine appears in certain varieties. Basaltic lavas, on cooling, in some cases form

columns that give a peculiar character to the scenery. Examples are seen in the Palisades of the Hudson River; the cliffs along the Columbia River in Washington; Fingal's Cave, on the island of Staffa, off Scotland; and the Giant's Causeway, Ireland. Lava flows in some places cover enormous areas; the basalt flows of Northwestern United States and of the Deccan, India, are each estimated to cover 200,000 square miles. The lava of the Hawaiian Islands is also basalt. Basalt is seldom used for any other purpose than road-making.

A.J.

Related Subjects. The reader is referred in these volumes to FINGAL'S CAVE; PALISADES; GIANT'S CAUSEWAY.

BASALTES, *ba sawl' teez*. See WEDGWOOD WARE.

BASCULE, *bas' kule*, **BRIDGE**. See **BRIDGE** (Movable Bridges).

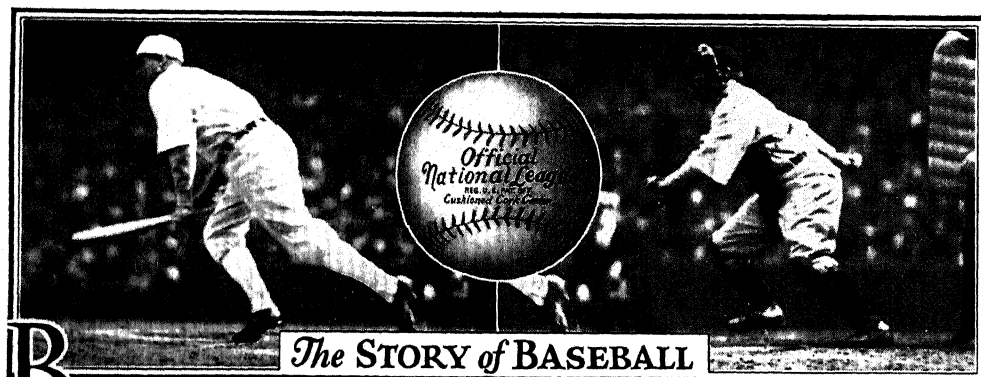
BASE, in chemistry, a compound which will unite with an acid to form a salt. Bases are the chemical opposites of acids (see **ACID**). They contain a metal united to one part of

hydrogen and sixteen parts of oxygen. Most bases are insoluble in water, but those which are soluble are of great practical value. These latter include caustic soda (sodium hydroxide), used to clean greasy sinks and pipes, and in making soaps, paper pulp, and bleaching substances; caustic potash (potassium hydroxide), similar to caustic soda, but more active; and ammonium hydroxide, the water solution of which is a common cleaning agent in the household.

Calcium hydroxide, used to make mortar and plaster, is a strong base that is only slightly soluble in water. Bases in solution turn litmus from red to blue; that is, they have an alkaline reaction (see **ALKALI**). T.B.J.

In Mathematics, base refers to the third side of a triangle and the part of a pyramid or cone on which it rests; in percentage (which see), to the number on which percentage is computed. See **TRIANGLE**; **PYRAMID**.

In Architecture, the base refers to the lowest division of a column or shaft (see **COLUMN**; **ARCHITECTURE**).



BASEBALL, the national game of the United States, is rapidly conquering the world. In Canada, though sharing in favor with lacrosse and soccer football, it is becoming more popular every year. Cuba, too, has its professional teams, and a few Cubans have been members of teams in the "big leagues" of the United States. While William H. Taft was governor of the Philippine Islands, baseball was successfully introduced among the Igorrotes as a substitute for head-hunting. The Filipinos, Japanese, and the Chinese in Hawaii play the game, and the two last named do it nearly as well as the best American amateur teams. A large number of cities in South America have clubs, and since league teams from the United States have made a tour around the world, several baseball leagues have been established in other distant lands.

Strangely enough, war has been largely responsible for the spread of baseball. Before the American War of Secession, the game was prac-

tically unknown, but thousands of soldiers learned the game while under arms, and afterward played it in their communities. Again, it was by soldiers that baseball was introduced to the Far East and to the Panama Canal Zone. During the World War many soldiers on temporary leave from the front watched the games of a three-club league on Saturdays in Paris. Hundreds of Italians who returned from America to fight for their country were baseball enthusiasts.

Baseball as a Science. Though the word *professional* in many other sports carries with it an inference of the undesirable, in baseball it stands for scientific athletics. So keen is the play of teams in the professional leagues, and so nearly perfect the defense of the players in the field, that their opponents know that the difference between a successful and an unsuccessful attempt at scoring is a matter not of seconds, but of a fraction of a second. The knowledge of strategy and of psychology which

both sides employ might be the envy of some generals in command of armies.

Each pitcher and catcher knows the individual peculiarities, abilities, and weaknesses of opposing batters, and the pitcher who throws the kind of a ball that the batter least expects is the one who wins games. The batter, on his side, must know the very few places toward which he can hit the ball where it will not be caught in the air or thrown to first base before he reaches it. One who makes three safe hits in ten times at bat ranks with the best.

Base-running is perhaps the most scientific feature of the game. If a runner starts from first base in an attempt to steal second just as the pitcher throws to the catcher, he is quite sure when he arrives there, five seconds later, to find that the catcher has thrown the ball to someone at second base in time to put him out. If he has a lead of a few feet and a start from first base when the ball is thrown, he may just win the race with it, but if he is too daring, he is apt to be put out by a sudden throw of the pitcher to the first baseman. The instant the ball is hit, fielders dash for the proper spot to catch or stop it. Almost before the spectators realize that the ball has met with a bat, a fielder may be many yards on his way. He throws it to the proper base almost with the same motion that intercepts it, and with machine-like accuracy to which a distance of two hundred feet seems no hindrance.

Almost perfect physical control marks the best players. The pitcher who can extricate himself from difficulties into which his own or his teammates' errors have put him, and the batter who can hit safely in an emergency, are sure of success.

Organized Baseball. There are in the United States two *major leagues*, the National, founded in 1876, and the American, its rival since 1900. Each league has eight teams, or clubs, which play almost daily from April to October. One team in each league wins the honors of the season. The two pennant winners are then matched, and the club which first wins four games is declared the world's champion team. A third league, known as the Federal, was organized in 1913, with a circuit of six clubs, but the organization was not successful financially, and it passed out of existence in 1915.

The several *minor leagues* of the United States and Canada are affiliated with the major leagues, and the two organizations have a working agreement whereby the "big" leagues are supplied with recruits from the minor clubs. Such transfers of players are accompanied by payments in money; the sum of \$50,000 has been paid for one infielder, and it is declared that more was once paid for an outfielder.

Baseball, as it is now conducted, is not only a clean, popular sport, but a highly specialized

business. The grounds and grandstands held by lease or owned outright by the major leagues represent a money value of from five million to ten million dollars, and it costs from \$400,000 to \$600,000 to purchase the franchise of an average club. The baseball patrons of the United States and Canada constitute a goodly number of the population of those countries. It is declared that not far from 10,000,000 people find time to see the national game during a single season. The total receipts for the six or seven games of a world's series now average more than \$1,000,000; the total attendance often exceeds 300,000.

The professional baseball player may not regard his occupation lightly. Men who win honors on the "diamond" are trained and disciplined. Temperance and clean habits are expected of all ball players, and late hours, over-eating, drinking, and other forms of dissipation are strictly forbidden. For several weeks before the opening of the season, the men are put through severe courses in physical training, that they may enter upon the serious work of the year in first-class condition. During the season, they travel in the most comfortable cars available, and they live in the best hotels. The manager of a team which hopes to defeat all other clubs in his league, in other words, must see to it that his team is kept in fighting condition throughout the season.

The personnel of a club is constantly changing, for men are released as they lose their skill, new material is ever being sought, and desirable players are often purchased from one team by another. The number of men on a team is also subject to change, but it is usually between twenty and twenty-five. In 1916 the National League fixed a limit of twenty-one players for each club, after midseason.

The baseball profession is a lucrative one. The ordinary utility man receives from \$3,000 to \$5,000 a year, while the annual salary of the "star" players, particularly pitchers, may be \$20,000 and upward. One player, an outfielder, has been paid \$70,000 for a season's work. After a scandal involving players who were charged with dishonest practices on the playing field, the major leagues engaged former United States Judge K. M. Landis as high commissioner of baseball, at a salary of \$50,000 per year, to restore the sport to an honest basis and to keep it on a plane which would meet public confidence.

Details of the Game

The Diamond. By noting the accompanying diagram, anyone can lay out a baseball field. The dotted lines should first be measured, at right angles to each other; the base lines should next be laid. All other lines are at right angles

umpire-in-chief most of the responsibility of decisions regarding base-runners. The next batter endeavors to help the base-runner to advance. If he makes a *single*, a *safe hit* bringing him to first base, the runner ahead is often able to advance two bases. A *two-bagger*, or hit which enables the batter to reach second base, ordinarily gives the first runner a chance to score. A *three-bagger*, or a *home run*, in which the batter scores himself, of course scores everyone who was on the bases ahead of him. Sometimes the batter makes a *sacrifice* hit, one which gives a runner an opportunity to advance, but does not enable the batter to reach first base. A common form of sacrifice is a *bunt*, in which the ball is hit so that it will roll slowly and not far from the home plate. If the runner advances without the help of the batter, he is said to have *stolen a base*. Should a ball hit by a batter be caught before falling to the ground, and be brought to the base which was occupied by a runner before the latter can return to it, both the batter and the runner are out, and the fielders have made one form of *double play*. With more than one runner on the bases, a *triple play* is sometimes made. One member of the team at bat may stand in each of the spaces marked *Coach*, to direct the batter and the runners.

As soon as three men of the side at bat are declared out, the fielding and batting teams change places. When each club has had a turn at bat, an *inning* has been played. Nine innings constitute a normal game; if at the end of them the score is a tie, the game continues until one side or the other is ahead at the end of an inning. The last half of the ninth inning is not played if the side which would be at bat is already ahead. By mutual agreement, or because of darkness or storm, five innings may be a full game.

Scoring. In nearly all games, both professional and amateur, a detailed record is made of the work of each player, called the *box score*. In a certain hotly contested game the score of one team was as follows:

PLAYERS	AB	R	H	PO	A	E
Miller, rf.	4	1	1	2	0	0
Arnold, ss	3	0	0	2	1	0
Wilson, cf.	3	1	2	2	0	0
Tice, rb.	3	0	0	9	0	1
Chapman, lf.	4	0	3	1	0	0
Graff, 3b.	3	0	0	1	6	0
Wagner, 2b.	3	0	0	2	1	0

Preble, c.	2	0	0	8	0	0
Reeve, p.	3	0	0	0	2	0
Totals	28	2	6	27	10	1

0 0 0 1 0 0 0 1-2

Three-base hit—Wilson. Earned runs—2. Sacrifice hits—Arnold. Sacrifice fly—Tice. Left on bases—4. Bases on balls—Preble, Wilson. Struck out—By Reeve, 6. Umpires—at plate, Foster; on bases, Lamberson. Time—1.48.

The following interpretation of the box score printed above will make the entire table clear even to a novice:

AB, the number of times *At Bat*, not including those when the batter made a sacrifice hit or reached first base by a *base on balls*, being hit by the ball, or interfered with by the catcher.

R, the number of *Runs*, or scores.

H, the number of *Base Hits*, or balls hit in such direction or with such speed that perfect fielding could not prevent the batter reaching base, or put out the runners ahead of him. It will be noticed that Chapman made the unusual record of three hits out of four opportunities, but scored no runs. However, this last hit, made in a *pinch* with two men of his side already out, enabled Miller to score from second base, winning the game.

PO, the number of opponents *Put Out*. In this instance,

the first baseman has the greatest number to his credit, the catcher standing next. In a game where the pitcher *strikes out* many, the catcher would have more. If the opposing batters continually hit into the air, the fielders have more.

A., the number of *Assists*, or times that a player assists in a *put out* by stopping, catching, or throwing the ball.

E., the number of *Errors* which result in gains for opponents, not including those of the pitcher in pitching or of the catcher in failing to stop a pitched ball. By adding the number of put outs, assists, and errors, we learn the total number of opportunities each player had and how reliable he is. Thus, Tice's error does not show him a poorer fielder than Chapman, for Tice had more chances.

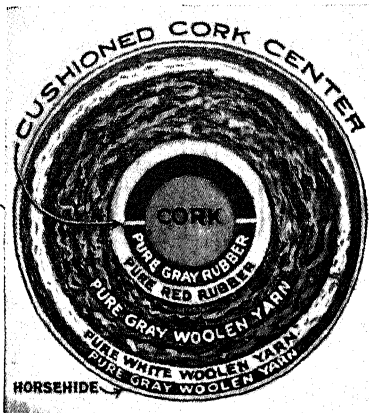
Earned Runs, those made without assistance by *errors* of the other side.

Sacrifice Hit, explained above in the text.

Sacrifice Fly, a ball hit into the air so far that, although it is caught before touching the ground, the fielder does not have time to return it in time to prevent a runner advancing.

Left on Bases. The number of men who reach bases and do not score shows in a general way the success or failure of team work.

Base on Balls shows something of the opposing pitcher's work, and more about the base-running. Reeve, the pitcher, gave no bases on balls.



INSIDE OF A BASEBALL

Subjects for Baseball Essays

The Most Exciting Game I Ever Saw

- (1) Preparing for the game
 - (a) Why I went
 - (b) With whom I went
 - (c) How we reached the field
- (2) Waiting for the game
 - (a) The weather
 - (b) The crowd
 - (c) The general spirit
 - (d) My own feelings of suspense
- (3) The actual game
 - (a) Relative strength of teams
 - (b) Exciting incidents
 - (c) The score
- (4) After the game
 - (a) How the victors felt
 - (b) How the defeated felt
 - (c) How I felt

What the Bat and the Ball Told Each Other

- (1) The Bat speaks
 - (a) Where I was bought
 - (b) My owner
 - (c) My appearance
 - (d) My first game
 - (e) How my first "strike" felt
 - (f) "Swapped" for a catcher's glove
 - (g) Broken and thrown in a corner
- (2) The Ball replies
 - (a) My pride in my original appearance
 - (b) Given as a birthday gift
 - (c) The delightful feeling of flying through the air
 - (d) My anger when the bat struck me
 - (e) Exciting games I played in
 - (f) The first rip
 - (g) Lost for a week
 - (h) Cast aside for a rival
 - (i) "Little brother's" plaything

Struck Out, the number of men put out by the pitcher's ability and judgment.

Umpires. Usually two, but in a very important game there may be four.

Had there been any in this game, the summary would also have included *stolen bases*, *two-base hits*, *home runs*, *double* and *triple plays*, *wild pitches*, and *passed balls* (pitched balls not stopped by the catcher).

Development of Baseball. In colonial times in America, a ball game called "rounders" was played. This has been thought by some to have been the beginning of the present-day game. Others attribute the origin of the game to Abner Doubleday, who in 1839 formulated playing rules. The first ball club was the Olympic Town-Ball Club of Philadelphia, organized in 1833. The game of townball was not the baseball of to-day, but resembled the boys' game of "one old cat."

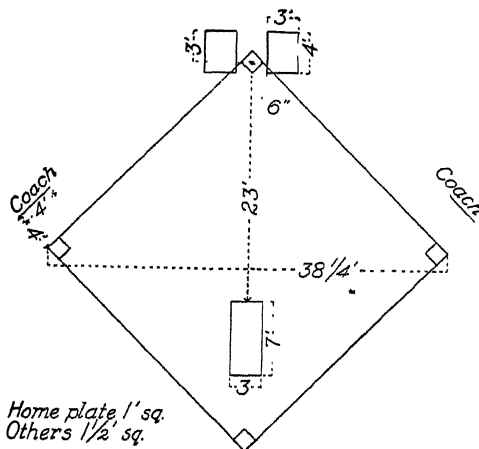
The first matches between organized clubs were played in 1843 in New York and Brooklyn. The first National Association was organized in 1858. At that time, the ball used was larger than at present, and the pitcher was required to toss the ball or pitch with an underhand swing.

From that date the spread of the game's popularity was rapid. Many teams were organized in Eastern cities, and it was not long before professionalism crept in. An attempt to correct various abuses was made at a convention in Philadelphia in 1867, which was attended by the representatives of more than 500 organizations.

The first club composed entirely of professional players was the Cincinnati Red Stockings, organized in 1868. Three years later, two national associations were formed to supervise both professional and amateur players. The National League started in 1876 with a membership of eight clubs. Nicholas E. Young was its first president. The American Association was organized in 1882, and for a number of years there was considerable rivalry between the two leagues.

The National and American leagues, with their membership of eight clubs each, were placed on their present basis in 1900. Six of the cities represented have teams in both leagues.

Indoor Baseball. This is a popular winter-time game in gymnasiums. It is modeled after the outdoor game, with changes necessary to



prevent damage to windows, and to adapt the playing to a small diamond. The ball is softer and larger than the outdoor ball. The bat is thinner. The bases are not fastened to the floor.

The main points in which the rules differ from those of outdoor baseball are the following: (1) Either seven or nine may constitute

OUTLINE AND QUESTIONS ON BASEBALL

Outline

I. How the Game is Played

- (1) The field
 - (a) Diamond shape
 - (b) Dimensions
 - (c) Bases
- (2) Players
 - (a) Number
 - (b) Position
 - (c) Duties
- (3) Umpires
- (4) The actual game
 - (a) Batting
 - (b) Base-running
 - (c) Fielding
 - (d) Innings
- (5) Technical terms
- (6) Scoring
 - (a) Careful record of each player's work

II. The Science of Baseball

- (1) What "professional" means in baseball
- (2) Great physical control and accuracy needed

- (3) Base-running—the most scientific feature

III. Organized Baseball

- (1) Major leagues
 - (a) National
 - (b) American
- (2) Minor leagues
 - (a) In Canada
 - (b) In United States
- (3) Training and care of players
- (4) Economic phases
 - (a) Large receipts
 - (b) Generous salaries

IV. Popularity

- (1) National game in United States
- (2) Popularity in other countries
- (3) Part taken in its spread by soldiers

V. Indoor Baseball

- (1) Difference in implements
- (2) Difference in rules

Questions

- How many people see the national game during a single season?
- How many members have the big-league teams?
- What is an earned run? What is a stolen base?
- What difference is there between the home base and the second base in material and in position relative to the base lines?
- In scoring, how do you know whether to credit the batter with a hit or give the fielder an error?
- What position must the pitcher assume when pitching?
- Which of the players usually make the greatest number of put-outs, and why?
- What is the difference between a foul in indoor and one in outdoor baseball?
- What three items would you take into consideration in figuring what percentage of a fielder's plays were made without errors?
- In what way can the batter make a strike besides failing to hit a fairly delivered ball?
- How does pitching in indoor baseball differ from that in outdoor baseball?
- What must the runner be careful to do when he reaches first base?
- How many men are there on an indoor baseball team?
- Where outside of the United States is baseball popular?
- What is the average income of a ball player?
- What are the requirements in a good player?
- Can a good player safely use stimulants?
- What is the highest price paid for a player?
- How are championships played and determined?
- When were the National and American Leagues organized?

a team; (2) the pitcher must swing his arm parallel with the body, and must stand within his *box*; (3) a pitched ball striking the batter does not entitle him to a base; (4) a batted ball is fair or foul according to where it first hits, not where it afterward rolls; (5) a base-runner must be at his base when the pitcher delivers the ball, and must not leave it till the ball has reached the catcher or has been hit.

BASEDOW, *bah' ze doh*, JOHANN. See PHYSICAL EDUCATION (Development through the Centuries).

BASEL, *bah' zel*. See SWITZERLAND (The Cities).

BASE LINE, in surveying, a line of known length and position, taken as the starting point for laying out townships and their subdivisions. For further description and illustration, see SURVEYING.

BASILICA, *ba sil' i kah*, among the ancient Romans, a great oblong hall in which the magistrates heard pleas for justice and rendered decisions. These courtrooms were common throughout the Roman world at the beginning of the Christian Era. The length of the typical basilica was about three times the width. At one end was the entrance; the other end, called the apse, which had the form of a half-circle, contained a platform on which the judges had their seats. The roof was supported by two rows of pillars, which ran from the apse to the front of the hall and divided the main floor into three aisles—a central aisle, called the nave, and a narrower one on each side of it, called a portico.

There were numerous modifications of this type; the famous Basilica Julia, for instance, one of the most notable buildings of ancient Rome, had five aisles and four rows of columns. The basilica furnished the model for the early Christian churches, and for a long time churches built on this plan were known as basilicas.

BASIN. In the ordinary meaning of the term, a river basin is the region drained by a river and all its branches, or the area drained by a river system. The Mississippi basin, for instance, includes all that part of North America drained into the Mississippi River and its tributaries. The term is also applied to regions in the interior of a continent, which have no outlet to the sea. In these regions, salt lakes are occasionally found, such as Great Salt Lake, in Utah, and the Dead Sea, between Palestine and Transjordan. The streams in these basins flow into the lakes or disappear in the sands. See MISSISSIPPI RIVER. R.H.W.

BASKET BALL, an American game, played either out-of-doors or in gymnasiums, and popular with both sexes. It is an excellent game, not only for physical exercise but for mental training, as it calls for concentration, quickness of perception and thought, and the "team work" which is so valuable a feature

of all group activities. Its rules governing fouls and behavior on the floor are so stringent that anger and loss of self-control practically rule one out of the game. Physically, the game does not demand the great strength required for football; but quickness, agility, endurance, a

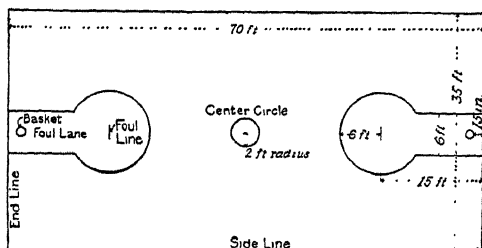


DIAGRAM OF COURT

keen sense of direction, and muscular control are essential. Throughout, it is a rapid game, well played only by enthusiastic players who throw themselves heart and soul into the sport.

Beginnings of Basket Ball. Unlike most games, basket ball was the invention of one man. James Naismith (born 1861), who was an instructor in the Young Men's Christian Association training school at Springfield, Mass., was its originator. In 1891 he worked out this game practically as it stands to-day in all essential features. Other associations throughout the country promptly took it up, and were later followed by schools and colleges, until now it is one of the most popular of athletic sports in America, and it has spread to England and other countries.

How Played. The game is played on a field laid out as shown in the accompanying diagram. This field must be longer than broad, and should cover not more than 4,500 nor less than 2,100 square feet of actual playing space, though a boundary territory on all sides is necessary; 70 x 50 feet is ideal, but the usual dimensions are 70 x 35 feet. At each end of the field, in the center, is a *goal*, which consists of the *basket*, suspended ten feet above the ground. This basket is an open hammock net suspended on a metal ring eighteen inches in diameter, which must be from six to fifteen inches from the rigid surface to which it is fastened. The ball, resembling a football, but round instead of oval, is an inflated rubber bladder in a heavy leather case. It is from thirty to thirty-two inches in circumference, and weighs from twenty to twenty-three ounces.

The rules of play are in two forms, one for a regular game, and the other for a so-called live game, both of which are played by both sexes, though the live game originated as women's rules. In the live game, the court is divided by extra transverse lines into zones, to one of which each players is confined. This

OUTLINE AND QUESTIONS ON BASKET BALL

Outline

I. How the Game Is Played

- (1) The field
 - (a) Dimensions
 - (b) Markings
 - (c) The goal—a suspended basket net
- (2) The ball
- (3) The “make-up” of the team
 - (a) Center
 - (b) Forwards
 - (c) Guards
- (4) Length and object of the game
- (5) The actual game
 - (a) Specific duties of each player
 - (b) Manner in which gains may be made
- (6) Scoring
 - (a) Baskets
 - (b) Free throws
- (7) Rules
 - (a) For the regular game
 - (b) For the “live” game
 - (c) Fouls
 1. Technical
 2. Personal

II. Advantages of the Game

- (1) May be played indoors or out
- (2) Played by either sex
- (3) Requires quickness but not great strength
- (4) Tends to increase
 - (a) Quickness of perception
 - (b) Self-control
 - (c) Speed
 - (d) Endurance
 - (e) Muscular control
 - (f) Team-work faculty

III. Basket Ball for Girls

- (1) Roughness eliminated
- (2) Too violent for only form of exercise

IV. History

- (1) Invention
 - (a) James Naismith
- (2) Rapid spread

Questions

- When was basket ball first played?
- Could a basket-ball field be correctly laid out on a floor fifty by forty feet?
- How many members of the team have the privilege of throwing for basket?
- Why is drill behind closed doors necessary to the making of a good team?
- How did it happen that basket ball was played at first only by Young Men's Christian Associations?
- Which would a team rather do, make a basket from the field or score on a free throw?
- What is the difference between a technical foul and a personal foul?
- What difference is there in the penalty dealt out for fouls?
- What advantage has basket ball over football for the average player?
- Describe the difference between a *regular* game and a *live* game. Which was originally designed for women?
- How far may a player run with the ball?
- How does the ball differ from that used in football? What are the goals?
- If two players get the ball simultaneously, how is it put into play again?
- What happens when a ball goes out of bounds?
- Who invented basket ball?
- What beneficial effects besides physical strengthening does the game have?
- If a game begins at eight o'clock, at what time will it close?
- Is actual play going on all the time?
- Which form of basket ball is commonly played by girls? What is its advantage?
- Which player has a chance to play first?
- Was the development of basketball the work of one man or was it due to the united efforts of several?
- Is basketball a college sport?
- What is a “free throw”?
- What is a personal foul? Will it disqualify a player?

eliminates many of the rougher or more active features. The directions here given apply practically to either game.

A team consists of five persons—a center, left and right forwards, left and right guards. Each player should have qualifications for his particular position, though the specialization is not so important as in football or baseball; frequently, in the regular game, a skilled player will “play all over the floor.” The game is played in two halves, usually of twenty minutes each, with ten minutes between, and its object is the “making of baskets” by either team.

Scoring. Each team has a basket for which it throws, trying at the same time to prevent the opposing team from making baskets. A “basket” counts two points, if thrown in active play, but a “basket on fouls” counts but one point. Whenever a foul is called by an official against any member of a team, the opposing team has a “free-throw”; that is, a chosen player stands at the free-throw line, fifteen feet from the basket, and tosses the ball toward the basket, no interference being permitted.

Course of the Game. The centers of the two teams take their positions in the four-foot circle in the middle of the field, each facing his own goal (the goal into which he will try to throw the ball), and the referee tosses the ball into the air between them, higher than they can jump. With this throwing of the ball, play begins. Each center tries to strike the ball as it comes down, and the players of both teams follow the ball about the field, attempting to seize it and throw it toward the goal. Though the forwards are the players whose specific duty it is to throw for basket, the center and the guards have the same privilege in the regular game. The special business of the guards, as the name implies, is to guard the basket, or rather to oppose the forwards of the other team, who are to be prevented from throwing for baskets. When the ball goes beyond the boundary line, it is put in play again by an opponent of the player who forced it out of bounds; or if the referee cannot determine which player touched the ball last before it went out of bounds, he puts it in play by tossing it up between the two opposing players who are nearest it.

A player may catch the ball, throw it, or strike it with the open hand, but he may not run with it, kick it, or strike it with the fist or body, and when he holds it, it must be entirely with the hands. Nor may he touch the body of any other person carrying the ball, nor lay hands upon the ball when it is in another's possession. If two players grasp the ball at the same time, the referee tosses it up between them as he does between the centers at the opening of the game.

The rules against foul plays, which include *technical fouls*, such as running with the ball, kicking the ball, or striking it with the fists, as well as such personal fouls as holding an opponent, pushing, tripping, or using unnecessary roughness, are very strict. As stated above, any foul gives to the opposing team a free throw, but only personal fouls disqualify a player. Anyone who makes four personal fouls is disqualified for the remainder of the game.

Basket ball gives excellent opportunity for team work, and every well-drilled team has signals which for certain formations and plays



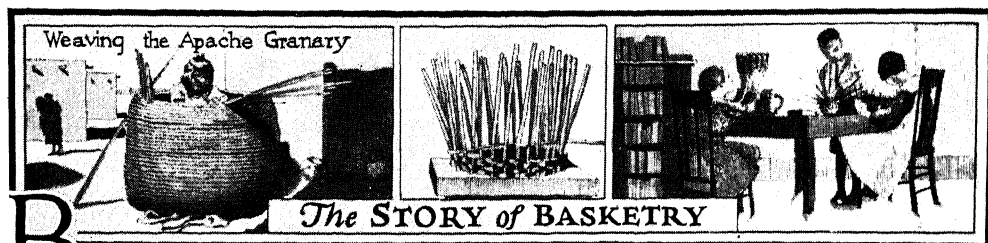
Photo: Keystone

THE ORIGINATOR OF BASKET BALL

James Naismith and the ball used in the game.

are intelligible to its own team, but which mean nothing to the opponents. Each team is usually organized with a captain at the head to assist in working out signals and to direct the team work during the game. By these signals, the general course of the play may be determined, but they must be very flexible, permitting of instant adjustment, for seldom does a game proceed as it has been mapped out.

Basket Ball for Girls. The elimination of roughness and “all over the floor” play makes basket ball an excellent game for girls, and many play the regular game; but it must be remembered that if rightly played it is never an easy, leisurely game. It is not suited to those who wish merely a little light exercise. Indeed, unless undertaken under the direction of a competent leader, the game is likely to prove too violent for anyone not in excellent condition. Any intending player of basket ball—man, woman, boy, or girl—should be examined for heart condition by a regular physician before engaging in play.



BASKETRY. "O let me do it," is the plea that every mother and teacher hears from day to day as the child, eager for something to occupy his hands and mind, discovers some simple work at which he thinks he can succeed. Thoughtful parents and teachers are constantly in search of occupations suitable for children, and one of the most available is that of making baskets.

Basketry is one of the most desirable occupations for children in the school and in the home, for the following reasons:

1. It is simple, and can be made successful without any large amount of previous training on the part of the teacher or mother.

2. It is inexpensive. It requires only a few simple tools, and the material is at hand with only the expenditure of labor necessary to gather and prepare it. This makes basketry especially suitable for rural schools.

3. It is one of the best occupations for training the hand and eye.

4. The baskets are useful, and in making them the child feels that he is contributing to the welfare of the home, as well as gratifying his desire to make something.

Material. There is a great variety of material suitable for making baskets. For convenience, we divide it into imported and native. The imported material consists of rattan, raffia, palm leaf, rushes, and hemp. The native includes willow, cat-tail, flags, rushes, straw, grasses, corn husks, willow bark, cedar bark, and for large baskets, splints of ash and other woods. The list above does not include all the materials available for baskets, for in each locality will be found something that may not be found elsewhere.

Preparation of Material. Since imported material is placed upon the market ready for use, our attention to preparation is confined to native material. The willow should be cut when the twigs are small, and the bark should be peeled off before the twigs are dry. If care is used in peeling the bark, it can be used for weaving. Flag leaves should be split into strands before they dry. All material should be dried as soon as collected; the color is better preserved if the drying is in the open air, where the material is exposed to the sun.

Tools. The only tools necessary are a sharp knife, a pair of strong shears, a bradawl or a large knitting needle, and a tape measure.

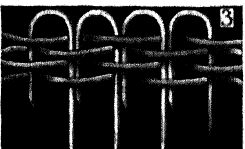
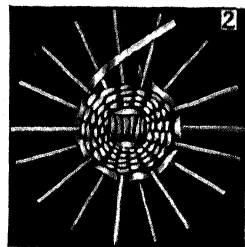
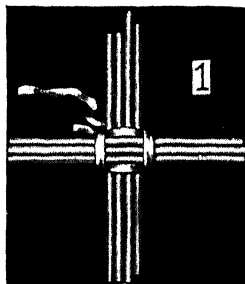
Mats. The first step in making baskets should be the making of one or more mats. The mat is easier to make than the basket, and it is also the foundation of the basket.

because in making the basket we must begin with the bottom. Two sizes of material are necessary, the larger size forming the frame, and known as *spokes*, and the smaller for binding the frame together, and known as the *weaves*.

If the material is dry and brittle, it should be soaked until it is pliable. Do not soak too long, or it will absorb so much water that it will swell; then it will shrink on drying, and the mat will be loose.

Take six pieces of rattan or small willow, as the case may be, 12 inches long, and one piece 7 inches long. Arrange them in two bunches of three each; cross them at right angles at the center. Hold them in the right hand, so that three will be horizontal and three will be vertical. Insert the seven-inch piece between the first and second vertical spokes above. Bind them together with the weaves, rattan, or bark, as shown in Fig. 1. Weave over and under the center from left to right, and pull the weaves down close to the center.

Begin to separate the spokes with the second row of weaving; with the third row they should be evenly separated, as in Fig. 2. When the mat is six inches in diameter, fasten the weaves securely and make the border. The spokes should extend three inches beyond the mat. Cut the ends, if necessary, to make them even. Sharpen the ends, so that they will push down between the weaves, then bend them, as in Fig.

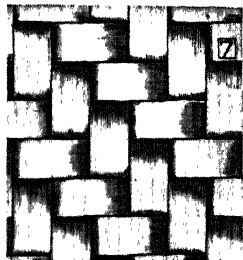
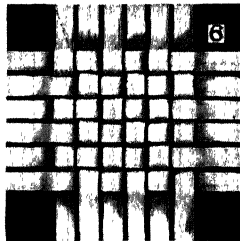
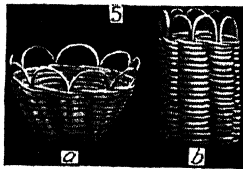
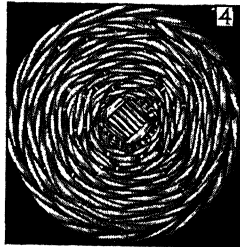


3. Fig. 4 shows the completed mat. Practice on mats until your weaving is even, and the mat is perfectly flat. Then you are ready to begin a basket.

Simple Basket. Let the basket be three inches across the bottom and five inches deep. This will require eight spokes 21 inches long, and one 11 inches long. Make the bottom of the basket just as the mat was made. Bend the spokes to an upright position, and fasten them by the first and second weave. If you wish a vertical basket, make the weave tight, but if you wish to have it larger at the top, let the weave be somewhat loose. When the right height is reached, make the border. Fig. 5 shows the completed basket, which will be in the form of *a* or *b*, depending on the tightness or looseness of the weave. When you have acquired skill in making a simple-weave basket, you will be able to weave with two or even three weaves, and to modify styles to suit.

Splint Baskets. Splint baskets are in common use wherever strength and durability of structure are desired. The most suitable material is black ash, which is easily split into long thin strips that become very pliable when soaked. The simplest weave for a splint basket is shown in Fig. 6, in which the splints cross at right angles, each splint of the "weft" passing alternately over and under the splints of the "warp." This style of weave is not suitable for the bottom of a round basket, but it may be used with equal success with both coarse and fine splints.

Twilled Work. A style of weaving known as *twill work* is common in baskets made from cane. It consists in passing each splint of the weft over two splints of the warp, then under two, thus forming a diagonal, or twilled, pattern. See Fig. 7.



Outline and Questions on Basketry

I. Advantages

- (1) Simple
- (2) Inexpensive
- (3) Good training
- (4) A useful art

II. Materials

- (1) Imported
 - (a) Rattan
 - (b) Raffia
 - (c) Palm leaf
 - (d) Rushes
 - (e) Hemp
- (2) Native
 - (a) Willow
 - (b) Cat-tail and rushes
 - (c) Straw and grasses
 - (d) Corn husks
 - (e) Bark
 - (f) Splints
 - (g) Hemp
- (3) Preparation
- (4) Tools

III. Weaving

- (1) Mats
- (2) Baskets
 - (a) Simple weave
 - (b) Splint baskets
 - (c) Twilled work
 - (d) Wicker
 - (e) Twined baskets
 - (f) Coiled baskets

Questions

Give four reasons why basketry should be popular.

What materials growing near your own home are suitable for basketry?

Why would it not be wise to soak the materials for basket-making over night?

In making a simple basket, how can you determine whether the sides shall slant or be vertical?

Which is the most intricate of all the styles of weaving?

What tools are necessary?

In finishing a mat, what is done with the ends of the spokes?

What is the difference between twilled work and wicker work?

Is morning or evening the better time for gathering materials?

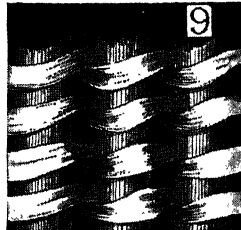
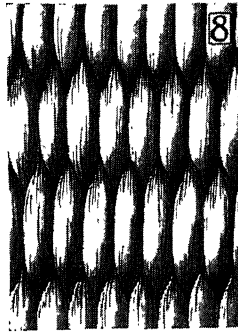
Is weaving done from right to left or from left to right?

What implements and what materials are used in making coiled baskets?

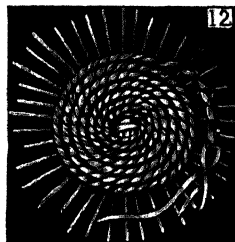
What tree furnishes the best material for splint baskets?

Wicker Work. Wicker work, Fig. 8, is commonly seen in willow baskets. It is subject to a great variety of changes, sometimes being combined with twilled work in forming borders.

Twined Baskets. Twined baskets are common among the Indians of the Rocky Mountain and Pacific coast regions. Twining is the most intricate and beautiful of all styles of weaving, and many baskets so made are marvels of skill and art. The warp is of strong rods or splints which are not easily bent; the weft is in pairs or in three-strand twining, and the braiding is in threes. Twining is subject to many changes of pattern; hence a great variety of styles may be made from it. Fig. 9 shows the method of starting a basket in three-strand braid and twine work. This work, however, is too difficult for beginners.



Coiled Baskets. Coiled baskets are easily made, and this method of construction is usually chosen for small baskets. Raffia, rushes, grass, cat-tail, flag, and other flexible material may be used. Coiled baskets are made by sewing over and over with a flexible material, each stitch interlacing with the one underneath. What corresponds to the warp in the woven basket is of coarser and more rigid material than that used for sewing. A needle with a large eye is necessary. Various stitches are used, each forming a different pattern, shown in Fig. 10, *a*, *b*, and *c*, and the long and short stitch, in Fig. 11. Fig. 12 shows the process of making a coiled mat. A beautiful style of open work is shown in Fig. 13, and Fig. 14 shows a pattern in which the stitches are coiled around three rods. Coiled basketry is admirably adapted to school and homework, and it lends itself readily to the use of such home material as grass, cat-tail, and corn husks. These are easily obtained and entirely without cost in almost any community.



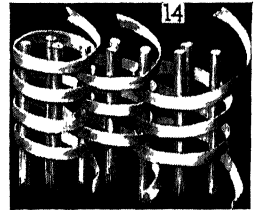
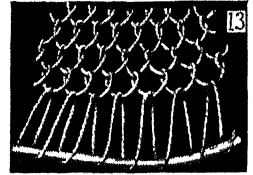
Among the Indians, coiled baskets have been found so small that they would pass through a lady's finger ring, while others are larger than an ordinary barrel.

BASQUE, *basque*, a brave, proud, and independent people of the mountainous regions of Northern Spain and Southwest France, whom no invaders have ever crushed or expelled from their native province. They have refused to mingle much with inhabitants of the neighboring provinces, but have kept unchanged their ancient customs, dress, and, above all, their language. This language, which, so far as is known, bears no relation to any other, is spoken by perhaps 400,000 people; it may possibly be the survivor of the ancient Iberian languages which the Latin, under the Romans, supplanted. Though industrious and home-loving, the Basques make excellent sailors or soldiers when the necessity arises. Ignatius Loyola, Saint Francis Xavier, and other famous men were natives of the Basque provinces.

[The fitted skirtless jacket formerly worn by women was called a *basque*, because it was copied from the garb of the Basque women.] c.w.

BASQUE LANGUAGE. See LANGUAGES OF THE WORLD. See above.

BAS-RELIEF, *bas' re leef'*, which means literally *low relief*, is a mode of sculpturing wherein the figures stand out but slightly from their background.



FROM THE PARTHENON

A marble frieze in bas-relief, by Phidias (which see). This specimen is now in the British Museum.

Strictly speaking, the projection should be less than half the thickness of the figure, but if the work is artistic, it may appear to the

observer to project considerably more. Pictured here is a part of the frieze of the Parthenon at Athens, the work of Phidias, which contains the most famous examples of bas-reliefs in the world. In every line, these figures give the sense of movement. The horsemen in the procession seem actually to progress, for the first horse has his leg raised but slightly, while those following show a gradual increase of spirited action. This depicts motion somewhat in the manner in which the very earliest moving pictures were made.

Related Subjects. The reader is referred in these volumes to the following articles:

Alto-Rilievo	Parthenon
Mezzo-Rilievo	Praxiteles

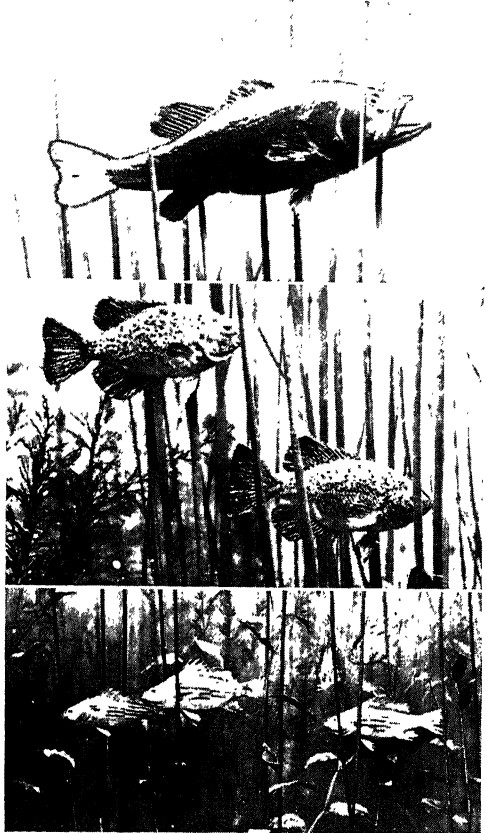
BASS, the name given to many species of fish which differ in size, shape, color, and markings, but which in general possess one common trait—they are all fighters, or game fish. They may be divided into two great groups—fresh-water and salt-water bass; it is the former with which the fisherman is most familiar.

Fresh-Water Bass, which belong to the sun-fish family, are chiefly of two species—the *large-mouthed black bass* and the *small-mouthed black bass*; and of these it may be said that, considering their size, they are among the gamest of fishes. Both species have short, compressed bodies, and are beautifully colored. The large-mouthed bass loves the quiet water of a lake, where it lurks near shore in the shelter of rocks or snags; but the small-mouthed species prefers the clear, running water of a stream. The former often attains a weight of from six to eight pounds, and sometimes even of twelve or fifteen pounds, but the latter does not grow so large. Both are excellent food fishes, their flesh being white, flaky, and very firm, if the fish are taken from cold water.

The black bass is caught best by casting, as it swims not far from the surface of the water and spies the bait the instant it strikes the water. A light rod, with tackle somewhat heavier than that used for trout-fishing, is the regular outfit. Bass will rise for minnows, frogs, or angworms, but quite frequently imitations of minnows are used. Many anglers use only live bait. The average trout cannot tire out a fisherman; most amateurs will find a struggle with five-pound bass a sufficiently sharp contest.

Salt-Water Bass are not closely related to those above described, but they, too, afford excellent sport. The best-known species is the *striped bass*, or *rock fish*, of the Atlantic coast. Angling for these great fish, which often weigh from forty to eighty pounds, is one of the chief sports of the eastern coast. With these, as with their inland relatives, casting is the most effective method, but the rod and tackle must be correspondingly stronger, and living bait seems

most attractive. Bass are found in all seas surrounding America. For various large members of the sea-bass family, see **JEWFISH**. L.H.



Photos: Visual Education Service

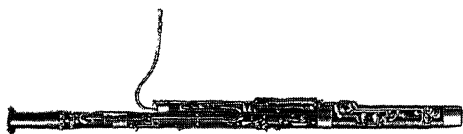
FOUR MEMBERS OF A DISTINGUISHED FAMILY
Fishermen will recognize these specimens, from top to bottom, as the large-mouth bass, calico bass, silver bass, and small-mouth bass.

Scientific Names. In scientific classification, the large-mouthed black bass is known as *Micropterus salmoides*; the small-mouthed, as *Micropterus dolomieu*. The striped bass is *Roccus lineatus*.

BASSE-TERRE, *bahs' taire*. See **GUADELOUPE**.

BASSOON', a musical wind instrument of the double-reed variety, played by blowing

through an S-shaped mouthpiece. Like a flute, its notes are produced by holes, some of which are stopped by keys, others by the fingers. It serves as the bass among wind instruments,



BASSOON

occupying the place of the cello among the strings, and it has a compass of three octaves. The low notes of the bassoon, when played in staccato time, have a grotesque quality which various composers have utilized, notably Mendelssohn in his *Midsummer Night's Dream*. For convenience of carriage, the instrument is divided into three or more parts, whence it derives its Italian name *fagotto*, meaning a bundle.

BASS, *base*, **VIOL**, the name commonly applied to the instrument which is correctly called *double bass*, or *contrabass*. The viol family of instruments includes treble, tenor, bass, and double-bass sizes; the double-bass viol was the precursor of the modern instrument technically called double bass. This is the largest stringed instrument played with a bow. The musician holds it between his knees, with the instrument resting on the floor. Its note is an octave below regular bass, and few musicians can play solos on it effectively. It is an important instrument in the orchestra, however. The double bass is made with three or four strings. See **VIOL**.



BASS VIOL

BASSWOOD, **BASS**, OR **LINDEN**, a large, handsome tree found east of Montana throughout the United States and Canada, in Europe and Northern Asia. In dense forests, it grows straight, but in open places it is a spreading tree, giving plenty of shade and shelter with its large, oval, tooth-edged leaves. The yellow flower clusters, fragrant and rich in honey, furnish an oil used in perfumes. The basswood grows to a height of eighty feet or more, with a diameter of four feet. It lives hundreds of years, and only

after the lapse of centuries reaches its full height.

These trees bear a nutlike, gray-green fruit the size of a pea, the seeds of which have a sail-like leaflet. When the pods are ripe, they



Photo: Visual Education Service

LEAVES AND SEEDS OF THE BASSWOOD

burst open, and the little seeds sail away on the breezes. The wood, sometimes called *whitewood*, because of its pale-brown color, is used for carriages, furniture, boats, and honey-boxes, and the tones from the piano come from basswood sounding boards. The inner bark is used for mats, fish net, cord, and coarse cloth. High-grade charcoal is also obtained from basswood.

In Berlin, Germany, there is a wide street nearly a mile long, lined with linden and chestnut trees, bearing the name "Unter den Linden." It is described in the article **BERLIN**. See, also, **LINDEN**.

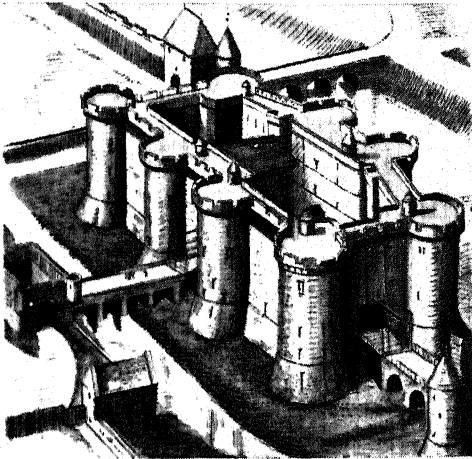
G.M.S.

Scientific Name. The linden family is *Tiliaceae*. The basswood is known as *Tilia americana*.

BASTIEN-LEPAGE, *bas tyaN' le pazh'*, **JULES** (1848-1884), a French portrait and landscape painter, whose work possessed a simplicity and naturalness that has brought him repute as the leader of a new school of art. He studied at Verdun and at the School of Fine Arts in Paris, and first won attention in 1874 by his *Song of Spring*, the picture of a peasant girl looking down upon a village. The same year he exhibited his *Portrait of My Grandfather*, showing the subject in the act of taking a pinch of snuff; this canvas was so unconventional as to be considered a new departure in portrait painting. Bastien-Lepage won the Cross of the Legion of Honor through his *Portrait of Madame Bernhardt*. His most important landscape painting, *The Hayfield*, now in the Luxembourg Gallery, is regarded as a fine example of realistic art. The Metro-

politan Museum in New York possesses his *Joan of Arc Listening to the Voices*.

BASTILLE, *bas teel'*, a famous Parisian prison whose destruction on July 14, 1789, made that date a national holiday of France. In the French language, *bastille* means any strongly fortified structure. The Bastille of Paris, built by Charles V about the year 1370 as a citadel, was used as a place of confinement



THE BASTILLE

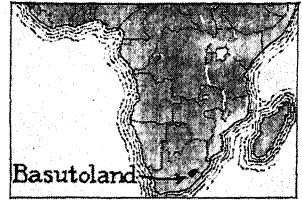
for those who had displeased the king or his court, and to the people it became a hated symbol of oppression.

The storming of the Bastille by the Parisian mob was the first act in the French Revolution (which see). It was the violent protest of the common people against the centuries-long oppression of the ruling classes. After the mob's demands for justice had been refused by the governor, Delaunay, its members assaulted the fortress. After hours of fighting, they had only effected an entrance into the outer court, but the arrival of a few pieces of artillery of the Royal Guard forced Delaunay to lower the second drawbridge, in order to admit it. The governor was seized, and on the way to the town hall was put to death.

On the following day, the razing of the Bastille commenced. The key was sent as a present to George Washington in America. To-day a bronze column marks the spot where the first struggle for French liberty took place.

BASUTOLAND, *ba soo' loh land*, one of the finest grain-producing and cattle-raising countries of the African continent. It is a British protectorate of South Africa, surrounded by provinces of the Union of South Africa. The region is mountainous, with well-watered valleys and fertile slopes, and it has several peaks which rise to a height of 10,000 feet. In 1871, the Basutos, who had lived under a semi-protectorate of the British since 1848,

were proclaimed British subjects, and the province was joined to Cape Colony. In 1879, the native tribes caused a revolt which the Cape forces were unable to put down. Finally, in 1884, when peace was restored, Basutoland was separated from Cape Colony and is now governed by a resident commissioner under the High Commissioner of



BASUTOLAND

South Africa. The Basutos are of Bantu stock, hardy, intelligent, and quick to adopt modern ideas (see BANTU). Area, 11,716 square miles; population, 500,000.

BAT, one of an order of interesting flying mammals, best described by their scientific name *Chiroptera*, which means *wing-handed*. Bats are adapted to a life in the air by a curious development of the fore limbs. The wing is a delicate, nearly hairless membrane, covering the bones of the hand and arm, but leaving the thumb free, and extending to the back limb. When outstretched, a pair of wings remind one of an umbrella, the forearm and fingers forming the ribs. In the illustration, the projection at the top center is a thumb. The membrane is supplied with blood vessels and nerves, and is wonderfully sensitive.

Bats whose eyes have been sealed up have been loosed in a room with dangling ropes, and have flown about without ever hitting one

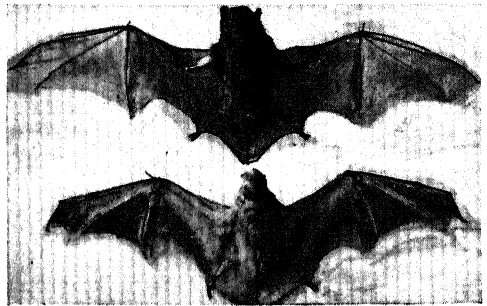


Photo: Visual Education Service

TWO OF THE BATS

Red bat at top; black bat, below.

of the strings, guided by the wing sense-organ. It is a mistake to think that their eyes are as useless as is implied by the expression, "blind as a bat." This idea undoubtedly arose from the smallness of the beady eyes and their being hidden in the fur with which bats are covered, and because these animals are proverbially creatures of the night. However, though they do not see well in bright daylight, they are not blind. Their hearing is exceed-

ingly acute, and they are equipped with large, movable ears, which in some species are expanded into huge membranes. Bats walk with difficulty, as their knees bend backward, but they readily climb or cling to trees, aided by a sharp claw on the thumb. They often sleep hanging downward from a branch. A mother bat, with her baby also upside down, clinging to her, is a curious sight.

There are about three hundred different kinds of bats, found in all warm and temperate climates. They vary in size, habits, and coloring, the largest and most brightly hued being found in the tropics. Northern bats are mouse-colored and of small size, some being no longer than two inches, though with a wing spread of a foot. Their food consists chiefly of insects. A Malayan species is a foot long, and five feet from tip to tip of spread wings. This is one of the fruit-eating bats, which frequently have long, barbed tongues. In South America, there are two species which suck the blood of other mammals (see VAMPIRE BAT). Many bats are remarkable for having a curious growth on the nose, shaped something like a horseshoe. In some species, these growths resemble leaves, and in one of these the entire nose looks like a flower.

Bats are very sociable creatures, often living together in large numbers; sometimes as many as a thousand will be found in one cave or deserted building. They are very useful to man, as they eat large numbers of insects. In warm climates, where very many live together, they supply a very rich fertilizer called guano (which see).

M.J.H.

Scientific Names. The order of bats is divided into several families. The species most commonly seen in north temperate regions is the little brown

bat, *Vespertilio subulatus*. The pipistrella, abundant all over Europe, is *Vesperugo pipistrellus*. A large South American fruit-eating bat is *Vampyrus spec-trum*.

BATANGAS, *bah tahng' gahs*. See PHILIPPINE ISLANDS (The Cities).

BATAVIA, JAVA, capital of the Dutch East Indies. See JAVA.

BATAVIA, N. Y. See NEW YORK (back of map).

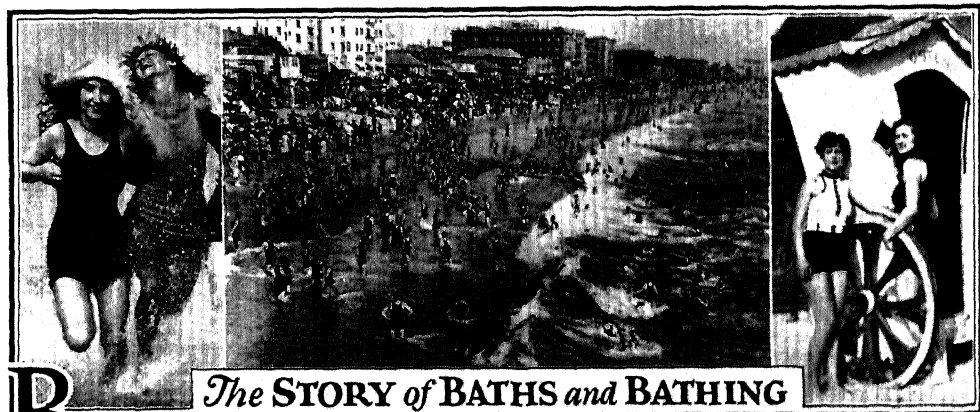
BATES COLLEGE. See MAINE (Education).

BATH, ENGLAND. See ENGLAND (The Cities).

BATH, KNIGHTS OF THE. The Order of the Bath is the oldest Order of English knighthood, but it is inferior in rank to the Order of the Garter, which is conferred only on noblemen (see GARTER, ORDER OF THE). The date of the founding of the Knights of the Bath is not known, but it was in existence in 1127, when, according to history, Henry I conferred knighthood on Geoffrey of Anjou. The recipient of the honor was required to bathe, the act being symbolic of the pure and cleanly life which his knightly vows enjoined. After falling into disuse for more than a century, the Order was revived by George I in 1725, and has since been in continuous existence.

Until 1847, the Order was military, but since that date this knighthood has been conferred by the sovereign on those deemed worthy of honor for services in the fields of science, art, or letters, as well as in the field of war. The Order comprises three classes, namely, Knights Grand Cross of the Bath (G.C.B.), Knights Commanders (K.C.B.), and a lower order of Companions (C.B.). Holders of the two former titles are entitled to the prefix "Sir"; the lower class carries no title.

BATH, ME. See MAINE (back of map).



B The STORY of BATHS and BATHING

BATHS AND BATHING. From an early period bathing has been practiced for cleanliness, health, comfort, and recreation, either in the home or in public establishments. Many peoples of antiquity, in the absence of

water, rubbed their bodies with oil; others employed clean sand. The ancient Romans considered the bath one of their luxuries, and they erected magnificent public buildings in which to gratify their taste for this form of physical

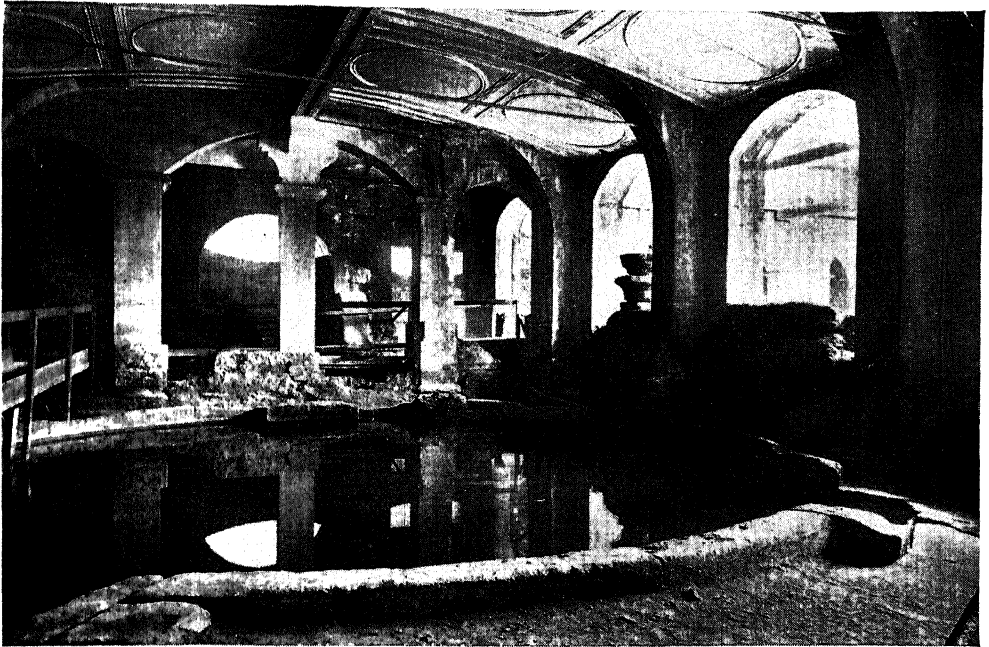


Photo: O R O C

ANCIENT ROMAN BATHS IN BATH, ENGLAND

The city of Bath is to-day a wealthy, picturesque, and popular watering place. Its springs attracted the Romans to the spot, and there they built great bathing pools, some of which are believed to have covered six or seven acres. Many of these have been restored, and when uncovered were found to be in a good state of preservation.

culture. Recent years have witnessed a revival of interest in the public bath, but there has been a new point of emphasis; for modern social workers consider it an important feature of their program for the uplift of humanity. Dr. Simon Baruch, who was the chief agent in securing legislation which required the establishment of municipal baths in New York state, publicly stated that money spent for public baths does more to raise the standard of health and morality than a much greater amount spent in any other way; the Boston Bath Commission has reported that the greatest single agency in decreasing the number of juvenile arrests in Boston, during a specified decade, was the people's bath. It is this humanitarian feature of the modern public bath that sets it apart from public bathing of the Roman age.

Modern Public Baths. These may be grouped into two general classes—open-air baths and baths in buildings. The former are represented by bathing beaches, which are maintained by all large cities that have sea or lake fronts, by bathing pools in city parks, and by the less familiar floating baths. Enclosed bathhouses usually have all the well-known devices for promoting cleanliness and providing recreation—bathtubs, shower baths, and swimming pools—though not all of these are always found in one establishment.

During the warm season, public bathing beaches are a wonderful boon to those city-dwellers whose bathing facilities are limited. Municipal beaches are sometimes operated with free service but more often a fee of a few cents is charged for the use of bathing suit, locker, and towel. As social workers have pointed out, these beaches not only provide wholesome recreation, but they have an educational value in that they encourage the bathing habit. Many persons who have patronized the beaches for the element of sport have learned the beauty and comfort of cleanliness.

Floating baths are most successful in towns on unpolluted bodies of water. Such a bath consists of a platform placed upon floats, and having in the center a pool surrounded by dressing rooms. By means of an ingenious arrangement of slats, the water circulates freely through the sides and bottom of the pool, and the bath may be moored at any suitable point along the water front. In cities where the rivers are polluted by sewage, these baths are not desirable.

Indoor bathing is practiced both for recreation and for cleanliness. In the best-equipped bathhouses there are shower or tub baths for cleansing the body, and a large pool for swimming. It is perhaps unnecessary to state that an enclosed swimming pool used for any pur-

poses other than recreation could not be kept in a sanitary condition. Patrons of these pools are required to wash the body in a tub or under a shower before plunging in for the swim. A model swimming pool has the walls and floor finished in marble slabs, glazed tiles, or other washable materials; a scum gutter runs along the sides at the water level to catch floating impurities, and there is a continuous inflow of pure water into the pool.

Considering its importance, the modern public-bath movement was late in starting. The first bathhouse provided with hot- and cold-water equipment to be established by a modern city was one opened in Liverpool in 1842. At the present time, every borough in Great Britain with a population of over 50,000 has municipally owned bathhouses, and the smaller cities are gradually adopting the idea. Germany, France, Austria, Norway, and Sweden maintain them in the larger cities; in Russia there are few. In rivers and lakes, under the Soviet rule, it is common for the sexes to bathe together in the nude.

In America public bathhouses are less common than in Europe, because of the prevalence of bathtubs in private houses. In modern building, even the little cottage or apartment is provided with bathing facilities. In the crowded tenement districts of the larger cities, however, the provisions for keeping clean are inadequate, and for this reason public bathhouses, located as nearly as possible in the center of thickly populated districts, are urged by social workers for every town where such conditions prevail.

In a recent survey of the progress of the public bath in the United States, it was found that New York, Chicago, Boston, and Baltimore have done the most in the matter of establishing such baths; that a large number of manufacturing cities have taken no steps whatever to provide free or cheap baths for their working population. In a few instances, baths have been installed in public schools; the first of these were provided in 1900 by the Paul Revere School of Boston. New York was the first state to pass a law making the erection of public bathhouses compulsory. In 1895, all cities in that state of more than 50,000 inhabitants were required to erect such establishments, to be open fourteen hours a day, and to be provided with hot and cold water. Buffalo, in 1897, opened the first public bathhouse under that law.

The Turkish Bath. This is one of the most thorough cleansing baths known. From medieval times, the religion of the Arabians made bathing compulsory, and the cleaning process which they originated has developed into a form of bath that has become known by this name. The bather is exposed to high temperatures until his body is profusely covered with

perspiration. The skin is then washed with cold water, and is rubbed with woolen cloths and smeared with soap or salve. The attendant at the same time kneads the muscles and bends the joints. After the whole body is scrubbed with soap and warm water, it is dried with a haircloth, and the hard skin of the feet is rubbed off with pumice stone. The bather then reclines on a couch in a cooler room until he acquires a natural degree of warmth.

The soaping and rubbing processes of the Turkish bath free the skin of practically all its grease and dirt accumulations, and it is to be recommended for those in robust health. Those suffering from sciatica, rheumatism, sore muscles, and various forms of lameness will find it beneficial, but it should be avoided by people with heart and kidney diseases. Never take a Turkish bath to break up a cold when it is in the fever stage, as there is then danger of contracting pneumonia. The Russian vapor bath is similar to the Turkish bath, but the perspiration is induced by permitting steam to envelop the bodies of the bathers.

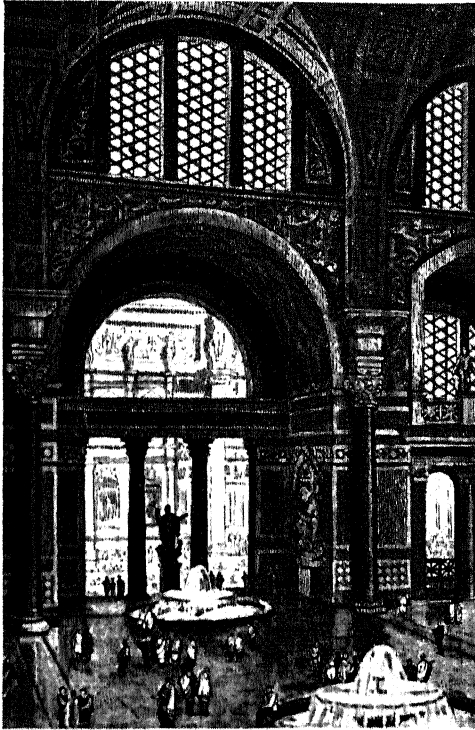
Bathing for Cleanliness and for Comfort. It is only by frequent washing of the entire body that one can keep the skin in a wholesome condition. About two and one-half million sweat glands are at work every day pouring out upon the skin the watery substance called perspiration, which contains water, oil, and waste matter from the blood. This perspiration, in evaporating, leaves upon the surface of the body solid and oily matters, which if neglected will clog up the sweat tubes and interfere with the skin's work of eliminating waste matter. For this reason, everyone should bathe frequently.

Just how often to bathe and what sort of a bath to take are matters that must be decided by the individual. Hot tub baths are said by many physicians to be weakening, if taken oftener than twice a week, but doubtless there are many persons who suffer no ill effects from the daily cleansing bath in hot water. Whether it be a dip in tepid water or simply a sponge bath, daily washing of the entire body is a very commendable practice.

The bath in cold water is popular because of its tonic effects. The first effect of cold water is a sensation of cold, which causes the blood vessels to contract. Then follows the reaction; that is, the blood vessels open again, the warm blood flows rapidly through the body, the skin feels warm, and the bather, who finishes his bath with a brisk rub, experiences a delightful sense of exhilaration and well-being. Not all persons experience this reaction, however, and the cold plunge is usually the exclusive privilege of the vigorous. It should not be indulged in if the after effect is a prolonged sense of chill. Nevertheless, one can accustom the body to the effects of cold water by a gradual

process; even a cold sponge bath or a dash of water over the chest and shoulders every morning will be found a valuable help in preventing colds.

Baths for the Sick. Vapor baths are used in treating certain skin diseases, kidney trouble, and chronic rheumatism. Carbonic-acid gas



BATHS OF CARACALLA

The baths of Caracalla, still magnificent in their ruins, could accommodate 16,000 people at one time. The building measured about a mile around. Its various apartments were adorned with beautiful paintings, stucco work, and statuary.

mixed with water provides a highly tonic bath that has been found helpful in cases of heart trouble, nervous ailments, insomnia, neuralgia, rheumatism, and gout; electric currents, made to pass through the body of the bather, are also employed by physicians for curing abdominal and intestinal troubles, sprains and contusions, and other ailments. Electric-light baths, in which the patient is affected by the chemical and physical influences of the light rays, were introduced at the Battle Creek (Mich.) Sanitarium in 1893. Such baths are strengthening, refreshing, and stimulating.

Mud baths, consisting of applications to the body of warm or hot mud, usually mixed with sulphur or other mineral substance, are given to patients suffering from what has been popularly called rheumatism. Another curative agent is the so-called *continuous bath*, intro-

duced into America in 1873. The patient rests in the tub in a hammock or a blanket, with his body under water and his head out, the temperature of the water being about 95°. He may remain in the bath for hours, days, weeks, or longer, according to his ailment. Patients suffering from certain skin diseases and affections of the joints have been kept in such baths for years. Insane persons and those addicted to alcoholic or drug habits are often quieted by this form of bath. Hot baths to relieve pain, reduce inflammation, control spasms, and quiet the nerves, and rubbing the body with salt are other commonly known methods of treating the sick.

The hot springs and medicinal springs in various regions of the earth attract many who are suffering from rheumatism and similar complaints. The most noted hot springs in North America are those at Hot Springs National Park, Arkansas. Among the noted mineral springs of Europe are those at Baden and Aachen, Germany; Teplitz and Carlsbad, Czechoslovakia; and Spa, Belgium.

Sun Baths. For a discussion of this topic, see the article HELIOTHERAPY.

Ancient and Medieval Baths. It would seem that civilized people have always believed in the bath, for Homer, writing ten centuries before the birth of Christ, mentions it as one of the first forms of refreshment offered to a guest. The Egyptians and Hebrews emphasized washing as a religious rite, and this idea was also common to the Greeks, who connected the bath with preparations for the sacrifices, for the reception of oracles, for marriage, etc. Public baths were maintained both by the Greeks and Romans, and among the latter they reached a magnificence unheard of in modern times. The imperial *thermae* (warm baths), covering enormous spaces in the heart of Rome, were a combination of library, gymnasium, garden, lecture room, and bathing establishment, and those of Titus, Trajan, Caracalla, and Diocletian are of ancient and time-honored fame.

When the culture of the Western Roman Empire gave way to the darkness of the early Middle Ages, the magnificent public baths were abandoned. Just to what extent bathing fell into disuse in Western Europe, historians are unable to say, but it is known for a surety that all the luxurious customs connected with the Roman bath were preserved in Constantinople, the capital of the Eastern Empire, and were adopted by the Mohammedans. From the eighth century to the present time, all the Mohammedan cities of the East have maintained public and private baths. B.M.W.

Related Subjects. The reader is referred in these volumes to the following articles:

Arkansas (Hot Springs)
England (Cities: Bath)

Massage
Mineral Waters

BATHSHEBA, *bath she' bah*, mother of Solomon (which see).

BATHURST, *bath' urst*, capital of Gambia (which see).

BATON ROUGE, *bat un roosh'*, LA. See LOUISIANA (back of map).

BAT-PARROT. See PARRAKEET.

BATRACHIA, *ba tra' ke ah*, a name originally given to a class of animals which includes toads, frogs, newts, and salamanders. The name means *froglike*. This class is more often known as *Amphibia*, which means *having a double life*. Since the latter name is more expressive of the chief characteristic of these animals it is preferred to the old name *Batrachia*. See AMPHIBIANS. M.J.H.

BATTALION, *ba tal' yun*, a term used in nearly every army to denote a unit of military organization, consisting of a body of troops whose numbers vary according to the standard of the army to which they belong. In the United States a battalion nearly always consists of four companies, with a total of about 1,000 men. A British battalion has 1,000 men, divided into eight companies. German battalions in the World War numbered 1,002, in four companies. French, Austrian, and Italian battalions have practically the same formation as did those of Germany. The battalion commander is a major (which see). See, also, ARMY.

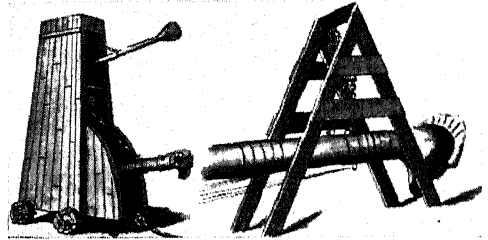
BATTENBERG, *bat' en burg*, a princely family of Prussia which has played a part in the history of Bulgaria, of England, and of Spain. Prince Alexander of Hesse, who married Countess von Hanke, was given to understand that the marriage could be looked upon only as morganatic—that is, that neither his wife nor his children could share his possessions nor bear his title. In 1853, however, the countess was created Princess of Battenberg, the name being taken from a little town of Hesse-Nassau, and her sons were accordingly known as princes of Battenberg.

The eldest son, Louis Alexander, Prince of Battenberg, became a naturalized British citizen, and entered the British navy. In 1884 he married his cousin, the Princess Victoria, a granddaughter of Queen Victoria. His rise in rank in the navy was steady, and was based on distinguished services. In 1911, he was made second sea lord of the admiralty, and in the following year was appointed admiral of the fleet.

The second son of Alexander of Hesse was the Prince Alexander of Battenberg, who was chosen prince of Bulgaria when that country became self-governing in 1879. By reason of his real ability, as well as his devotion to his adopted country, he deserved well at the hands of the Bulgarians, but political troubles ran high, and in 1886 he was compelled to resign the throne.

A younger brother of the foregoing, Prince Henry Maurice, married the Princess Beatrice, daughter of Queen Victoria, and it was his daughter, the Princess Victoria Ena, who in 1906 became queen of Spain, as the wife of Alfonso XIII (which see).

BATTERING-RAM, a device of the days before the invention of gunpowder and heavy guns, for battering down the walls of besieged places. As used by the Greeks and Romans, it consisted of a beam, or spar, with a massive metal head often shaped like the head of a



TWO FORMS OF ANCIENT BATTERING-RAM

ram, which suggested the name of the weapon. It was carried on the shoulders of a number of men, who rushed it against the walls, or it was suspended by chains to a beam set across two uprights. Sometimes the framework was mounted on wheels, which greatly increased its effectiveness. Often the ram was 120 feet or more in length, with a head weighing nearly two tons, requiring 100 men to work it. The soldiers operating the battering-ram were usually protected by a screen. During the siege of Jerusalem, the Romans used battering-rams with terrible effect, no part of the walls being able to withstand their constant blows.

BATTERY, ELECTRIC. See ELECTRIC BATTERY.

BATTLE, TRIAL BY, OR WAGER OF. See ORDEAL AND COMBAT, subhead.

BATTLE CREEK, MICH., in Calhoun County, in the southwest part of the state, is twenty-two miles east of Kalamazoo, 165 miles east of Chicago, and 121 miles west of Detroit. It is at the junction of Kalamazoo River and Battle Creek. The town was settled in 1831, and was incorporated as a village in 1850. Trouble which occurred between surveyors and Indians at this point is a circumstance said to have given the city its name. A charter granted in 1859 was revised in 1900. The commission form of government was adopted in 1913. Population, 1928, estimated, 46,100.

Industries. Largely due to the dietetic reforms of its famous Sanitarium, Battle Creek has become noted as a manufacturing center of breakfast foods and for publications of diet-reform literature. The city has extensive manufactories of thrashing machines and other farm implements, and produces printing presses and automobile parts. Extensive

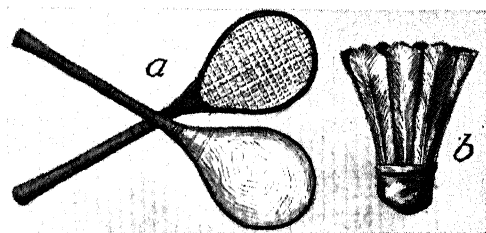
car shops of the Grand Trunk Railroad are located here.

Railroads. Battle Creek is on the Michigan Central and Grand Trunk railroads. Interurban electric lines and motorbus routes connect with Detroit and neighboring cities and towns.

Institutions. Battle Creek is the home of Battle Creek Sanitarium (established in 1866). Battle Creek College, equipped for physical education, home economics, and nurses' training, has more than local prestige. A veterans' bureau hospital has been built at Camp Custer, near the city.

R.H.

BATTLEDORE AND SHUTTLECOCK, a game played with a small racket, called a battledore, and a shuttlecock made of a piece of cork or other light material, with feathers fixed round the top. The racket may be covered with stout parchment, or be made of strings crossed and fastened, as in a tennis



BATTLEDORE AND SHUTTLECOCK

(a) Two forms of battledore; (b) the shuttlecock, which is not so large in proportion to the size of the battledore as the illustration would lead one to believe.

racket. Two players stand facing each other a few yards apart; they hit the shuttlecock back and forth as many times as possible without allowing it to touch the ground. The player who permits the shuttlecock to fall to the ground loses a point. A game may consist of any number of points agreed upon by the players.

This mild but interesting sport is of very ancient origin, and it has been popular in China, India, and other Eastern countries for at least 2,000 years. A modern development of it is known as *badminton*, and it is popular as an indoor winter pastime in England. The racket and shuttlecock are heavier than those used in the older game, and the rules of badminton are similar to those of tennis. A net is placed across a marked court, and the shuttlecock is sent back and forth over the net. It is usually played by four persons, two on each side of the net.

BATTLE HYMN OF THE REPUBLIC, a stirring popular hymn, often sung by Americans on patriotic occasions. It was written by Julia Ward Howe in 1861, to the music of the old song *John Brown's Body*, and the author herself, told how she happened to write it. She went, during the War of Secession, to watch a review of Union troops, and later de-

scribed her return to Washington in the following words:

The road was so filled with soldiers that our return from the parade grounds was very tedious, and to pass the time away we sang *John Brown's Body*. Some of the marching regiments took it up, and it was passed along the road until the echoes reverberated for miles. My pastor asked me why I did not put the spirit of the song into some gracious and expressive words. I told him I had tried. One morning soon after that, I awoke suddenly, and the lines I wanted were running vaguely through my mind. I arose and put them down. They were published in the *Atlantic Monthly*, and the editor (James Russell Lowell) named it "The Battle Hymn of the Republic."

The first stanza runs as follows:

Mine eyes have seen the glory of the coming of the
Lord;
He is tramping out the vintage where the grapes of
wrath are stored;
He has loosed the fateful lightning of his terrible,
swift sword—
His truth is marching on.

BATTLESHIP. See WARSHIP.

BATUM, *ba toom'*. See GEORGIA (Transcaucasian Socialist Federated Soviet Republic).

BAUCIS, *baw' sis*, and **PHILEMON**, *fil' e-mon*, an aged couple who, according to an old myth, were wonderfully rewarded for their kindness and hospitality. One evening Jupiter and Mercury, who had been wandering about the earth in disguise and had been driven from a village by its unkind inhabitants, came to the cottage of Baucis and Philemon. The old couple, not recognizing their visitors, kindly received the gods, and gave them the best from their frugal store. While they were at the table, Baucis and Philemon were amazed to see that the milk pitcher was no sooner emptied than it was filled again. Realizing that they were entertaining divine, and not mortal, guests, they fell on their knees in worship. Their little cottage was then changed into a beautiful temple, of which they were made priest and priestess. Years later, when they were very, very old, they were changed into two graceful trees which stood beside the temple gates. See JUPITER; MERCURY.

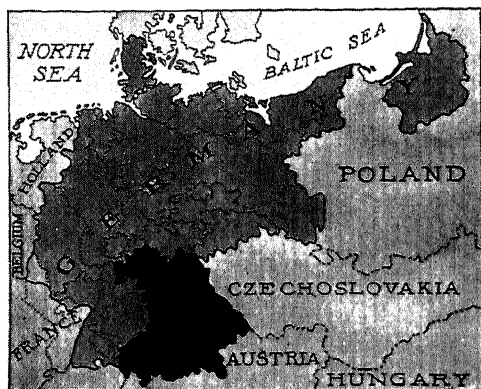
BAUXITE, *bo' zite*, commonly called *bank'-site*, a substance of commercial value as the chief source of aluminum (which see). It is an indefinite aggregate, composed chiefly of aluminum, oxygen, and hydrogen. It occurs in claylike earthy masses, and is produced by the weathering of certain rocks. When pure, it is white or grayish, but impurities, especially iron, impart a red or brown color. Besides being a source of aluminum, it is used in the manufacture of an abrasive and of alum (which see).

Bauxite takes its name from the locality in France where it was first found—Baux, or

Beaux. Arkansas produces from eighty to ninety per cent of the amount mined in the United States, but other deposits occur in Alabama, Georgia, and Tennessee. A.N.W.

BAVARIA, *ba va' ri ah*, with the exception of Prussia, is the largest state of the German republic. As a kingdom, before the World War, it consisted of two distinct parts—Bavaria proper, on the extreme southeast of the empire, with Austria-Hungary on the east and south, and Western Bavaria, or the Rhine Palatinate, which lies to the west of the Rhine River. The constitution adopted in 1919 established Bavaria as a state of the republic, with a total area of 29,334 square miles; it has a population of 7,379,594 (1925). South Carolina is a little larger, with about one-fourth the number of people.

Physical Features and Resources. Bavaria is almost entirely cut off from the surrounding states by mountains, within which lies a basin-



THE FORMER KINGDOM OF BAVARIA
Its location in the new Germany.

like plateau of 1,600 feet elevation, broken by ranges of hills. Most of the country is drained by the Danube River, but in the northwestern part the drainage is toward the Main.

More than any other German state, Bavaria is given over to agriculture, and many agricultural associations have aided in spreading advanced methods, until the soil has been brought to a point of productiveness equaled in few other sections of the world. Grains, potatoes, and hay are the principal crops, but hops also are raised in large quantities, for Bavaria is the greatest beer-producing spot in the world.

Government. Bavaria is a democratic republic with parliamentary government within the republic of Germany, but a state without a president. The controlling element is the Diet, which is elected by universal suffrage. It consists of a single chamber, the members of which are chosen every four years.

History. The inhabitants of the territory now known as Bavaria were Celts at the time

the country first engaged the attention of historians (see CELTS). The Celtic tribe was conquered by the Romans, about 15 B.C.; in the eighth century, the Franks gained control, and Bavaria was included in the empire of Charlemagne. After his death and that of his immediate descendants, it was constituted a duchy, and in 1180 was transferred to the family of Wittelsbach. The Rhenish Palatinate came into the possession of the same family in the next century; the connection between these two parts of the kingdom is thus an old one, though it has at various times been broken. One of its dukes was for a brief time (1742-1745) emperor of Germany. See PALATINATE.

Its Years as a Kingdom. Napoleon made of Bavaria a kingdom in 1805, and increased its territory because its king furnished him an army, and although a portion of this land had to be given up at the final adjustment after Napoleon's fall, the new kingdom was considerably larger than the old duchy. A constitution, which with certain changes is still in force, was adopted in 1818, but the people did not receive from it the larger liberties which they had expected. This was largely owing to the inability of successive kings to realize the needs of the country.

In times of peace Bavaria had control of its own army, but in war times this passed under the sway of the empire. When the World War broke out in 1914, Bavaria was prompt to send its quota of troops, and the Bavarian contingent under Prince Leopold, brother of the Bavarian king, was the first to enter Warsaw when that city fell to the Germans in 1915. On November 22, 1918, the dynasty was deposed, and Bavaria was declared a republic. For further account, see the article GERMANY (History).

BAVARIAN SUCCESSION, WAR OF THE. See SUCCESSION WARS.

BAYA, *bah' yah*. See WEAVER BIRD.

BAYARD, *ba yar'*, PIERRE DU TERRAIL (known as CHEVALIER BAYARD) (1476-1524), a French knight whose chivalrous virtues won him the title of "the knight without fear and above reproach." Unlike most characters of medieval history and legend, he satisfies the standards of the most critical modern historian, by reason of his bravery, his generosity, and his unblemished honor.

He served under the French kings Charles VIII, Louis XII, and Francis I, and under all of them he achieved wonderful successes over the Italians, Spaniards, and English. One of his most famous exploits was the defense of a bridge at Garigliano, in 1503, against the assaults of 200 Spaniards. The brilliant victory at Marignano, 1515, was won largely through his efforts, and Francis I bowed before him, after the victory, to receive knighthood from him.

BAYARD, *by' erd*, THOMAS FRANCIS (1828-1898), an American statesman, of a family distinguished for ability. His grandfather, James Asheton Bayard (1767-1815), and his father, of the same name (1799-1880), were United States Senators, and young Bayard was brought up in the traditions of the Democratic party. He was born at Wilmington, Del., studied law with his father, and while still a young man, acquired a reputation as an attorney. With his father, he opposed the War of Secession, feeling that though the South did wrong to secede, the North also did wrong in trying to prevent secession by force.

Elected to the Senate in 1869, to succeed his father, he became a leader among the Democrats, and was several times mentioned as a candidate for the Presidency. President Cleveland appointed him as Secretary of State in 1885, and he served with credit during the Bering Sea trouble and other crises. In 1893 he was sent as ambassador to Great Britain.

BAYBERRY, a tree whose distilled leaves are used in the manufacture of bay rum.

Related Subjects. The reader is referred in these volumes to the following articles:

Allspice	Candleberry
Bay Rum	Tallow Tree

BAY CITY, MICH., the county seat of Bay County, is in the eastern part of the state, on the Saginaw River, about six miles from its entrance into Saginaw Bay. Detroit is 108 miles southeast; Saginaw is thirteen miles south.

The site of the city was once the camping ground of the Chippewa Indians. The first white settlement was made in 1836; the place was incorporated as a village in 1857, and it became a city in 1865. Bay City and West Bay City, on opposite sides of the river, which is spanned by several bridges, were consolidated in 1905. The city is governed on the commission-manager plan. Population, 1928, Federal estimate, 49,600.

Industries. From its earliest history, Bay City has been engaged in lumber manufacturing. The industries include ship and yacht yards, box factories, and other large wood-working plants. There are also a chicory plant, and manufactories of mill supplies and machinery, salt, sugar, alcohol, and chemicals. Automobile bodies and parts are also manufactured; and there are large factories for the making of dredging machinery. There is coal mining, and an extensive shipping trade.

Transportation. Bay City is served by the Michigan Central, Pere Marquette, Grand Trunk, and the Detroit & Mackinac, and by electric and motorbus lines. Steamers ply between this and other lake ports.

Institutions. The city has a junior college, a public library, the Bay County Bar Library, and a state armory. D.F.W.

BAYEUX TAPESTRY, *ba yuh' tap' es trie*. See TAPESTRY, subhead.

BAYONNE, *ba yohn'*, N. J., located in Hudson County, occupies the entire peninsula extending between New York and Newark bays, on the northeastern coast of the state. It is separated from Jersey City on the north by Morris Canal and from Staten Island on the south by Kill van Kull. New York City is six miles northeast.

The city of Bayonne includes several former villages. In 1869 it became a city, and was rechartered in 1872. It is governed by commissioners and a mayor chosen by them. Population, 1928, estimated, 95,300.

Industries. Bayonne is one of the leading industrial cities of the state, and is noted especially for its large petroleum and coal interests. On Kill van Kull are located the immense Port Johnson Coal Docks, from which great quantities of coal are shipped. Immense petroleum refineries also are connected by pipes with the oil fields of Pennsylvania and with several of the leading cities on the Atlantic coast. There are large color-paint and chemical works, manufactories of steam boilers, electric launches, radiators, and silk mills.

Transportation. The city is served by the main line of the Central Railroad of New Jersey, and interurban, motorbus, and ferry lines. The excellent railway accommodations induce many New York merchants to make Bayonne their home.

BAYOU, *bi' oo*, STATE, a popular name applied to Mississippi (which see).

BAYREUTH, *bi roit'*. See GERMANY (Principal Cities).

BAY RUM, a widely used liquid toilet preparation, made by mixing the oil of bay with alcohol and water, and adding small amounts of the oil of orange peel and of allspice, to improve the odor. The oil of bay is obtained by distilling the leaves of the bayberry (*Pimenta acris*), a West Indian tree of the myrtle family. Bay rum is chiefly used by barbers, hairdressers, and perfumers, but it is sometimes employed as a liniment in cases of rheumatism. It is made in the West Indies by distilling rum in which bay leaves have been steeped. See BAYBERRY and its related subjects. G.M.S.

BAY STATE, a popular name applied to Massachusetts (which see).

BAY TREE, the name of several different trees, some of which have been famous in literature and history. The *Psalms* speak of "the wicked spreading himself like a green bay tree"; the ancient Greeks used sprigs of bay, or laurel, to crown the victors in the Olympian Games (which see). The victor's laurel of the

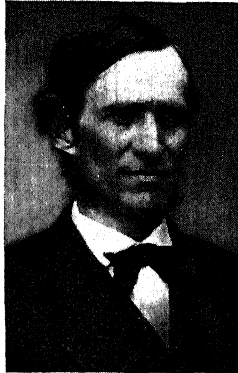


Photo: Brown Bros.

THOMAS F. BAYARD

ancients was the *sweet bay*, an evergreen tree of the laurel family, native to Mediterranean countries. From the custom referred to above has come the expression, "to win his bays," meaning to gain praise and renown.

The *sweet bay* of America, also called *white bay* and other names, belongs to the magnolia family. It is found along the Atlantic coast from Massachusetts to Florida, and in the Gulf region west to Texas. The tree, an evergreen, has attractive green leaves with a silvery sheen, and creamy-white flowers. G.M.S.

Scientific Names. The sweet bay of the ancients belongs to the family *Lauraceae*; its botanical name is *Laurus nobilis*. The sweet bay of America belongs to *Magnoliaceae*; it is classed as *Magnolia glauca*. One of the rhododendrons is called *rose bay*, and there is a *red bay* related to the sassafras.

BAZAR, OR BAZAAR, *ba zahr'*, an Oriental market for articles of all sorts, in which traders maintain small stalls or shops. Sometimes a bazaar is confined to a single narrow street; at other times it spreads out through a number of streets, all of which may be covered. Gossip is carried on quite as much as trade; this accounts for the setting for many of the tales of the *Arabian Nights*. In America, the name has come to mean a sale of various objects for philanthropic purposes.

BEACH, REX (1877-), an American writer whose stories of adventure, published originally in magazines and later in book form, have given him a place among America's popular novelists. He was born at Atwood, Mich., studied at Rollins College, Fla., and afterward fitted himself for the profession of law. The success of various short sketches sent to the magazines determined him, however, to give his time to the writing of tales rather than to the trying of cases, and with the appearance of *Partners* and *The Spoilers*, the latter a vivid story of Alaska life, he made many friends among the reading public.

Well-Liked Stories. Beach's stories are clean and vigorous, and have an ever-present touch of humor. Several have been made into very successful moving pictures. Among his popular tales are *The Barrier*,

The Silver Horde, *The Ne'er-do-Well*, *The Iron Trail*, *The Crimson Gardenia*, *Flowing Gold*, *Big Brother*, *Padlocked*, and *The Mating Call*.

BEACON, N. Y. See NEW YORK (back of map).

BEACONSFIELD, EARL OF. See DISRAELI, BENJAMIN.

BEADS, *beadz*, small ball-shaped objects of every conceivable color, made of metal, coral, amber, ivory, stone, glass, wood, and other substances, and used in a great variety of ways. As jewelry, they are strung on threads to form necklaces and bracelets. Rosaries are strings of beads used by Roman Catholic communicants in counting prayers; it is interesting to note in this connection that the term *bead* comes from a word common to the Teutonic languages, which signifies to *pray*. Tiny beads are sold in the shops in skeins, to be knitted or crocheted into beadwork for making bags, purses, watch fobs, candle shades, and numerous other articles. Wooden beads, brightly colored, are familiar in the kindergarten.

Beads have been commonly used for centuries as the equivalent of money among savage races. The Indians who traded with the New England colonists made beads of wampum (which see) so beautiful that they had a fixed price, three black beads or six white ones being worth one English penny. The wampum beads were drilled out of shell by means of a wooden shaft which had a point of jasper or flint. Some early tribes of Western Indians fashioned beads of rainbow-colored abalone shells, found along the Pacific coast.

Seeds, beans, and berries are natural beads that the children love to string into chains. Black-eyed Susans and tiny scarlet beans tipped with black make especially gay necklaces. Job's-tears, the hard, tear-shaped seeds of the grass known by that name, ranging in color from pearly white to black, are perhaps the most commonly used of nature's beads.

BEAGLE, *be' g'l*, a very small hunting hound, in form closely resembling the foxhound (which see). Beagles are distinguished for beauty, amiability, and hunting qualities. The regulation height of these dogs is twelve to fourteen inches, though larger sizes have been produced by cross-breeding. There are smooth- and rough-coated varieties. With its wiry but compact body, clean-cut shoulders, and muscular thighs, the beagle makes a fine appearance, and is just quick enough in following hares and other small game to make it interesting for a hunter to follow on foot. The dogs hunt in packs. The breed originated in England. M.J.H.

BEAM. See BRIDGE; CARPENTRY.



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